

SHIPSHEWANA LAKE RESTORATION PROJECT CONSTRUCTED WETLANDS PHASE

March 1998

Property of Lake and River Enhancement Section Division of Fish and Wildlife/IDNR 402 W. Washington Street, W-273 Indianapolis, IN 46204

Prepared for:

Indiana Department of Natural Resources Division of Soil Conservation 402 West Washington Street, Room W-265 Indianapolis, Indiana 46204-2748

Prepared By:

F. X. Browne, Inc. P. O. Box 401 Lansdale, PA 19446

TABLE OF CONTENTS

SECTION .	<u>PAGE</u>
1.0	Introduction and Project Description
1.	Introduction 1
2.	Reason and Purpose for the Project
3.	School Site Constructed Wetlands 1
4.	Sara Davis Ditch Constructed Wetlands
2.0	Regulatory Processes and Administration
1.	Permit Descriptions
2.	Erosion Control 7
3.	Maintenance Plan 8
4.	Inspections 8
5.	Post Construction Monitoring
3.0	Constructed Wetlands Design
1.	Hydrology and Hydraulics
2.	Land Rights 10
3.	Construction Cost Estimate
4.0	Construction Specifications (attached)
FIGURES	
1.	Elementary School Site Photographs
2.	Typical Forebay-Constructed Wetland System
3.	Typical Pond-Wetland System 6
APPENDICES	
A.	LOCATION MAP
В	CALCULATIONS
	1. Hydrology
	2. Wetlands Design
	3. Plant Requirements
	4. HEC-RAS Modeling of Sara Davis Ditch
C.	PERMIT APPLICATIONS & APPROVAL INFORMATION
D.	POST CONSTRUCTION MONITORING FORM
E.	CONSTRUCTION COST ESTIMATE

1.0 Introduction & Project Description

1.1 Introduction

Lake Shipshewana is approximately 205 acres in size and was created in the early 1960's through the installation of a sheet pile dam. This dam discharges into Page Ditch, which is the only lake outlet. The lake has two inlets: Mud Lake Ditch on the west side of the lake and the Sara Davis Ditch on the south side.

The Shipshewana Lake Watershed encompasses approximately 4,675 acres, with predominantly agricultural land uses. However, low density residential use is increasing. The land adjacent to the lake is heavily developed with single family residences and a church camp. The eastern shore was developed in the mid 1960's. At that time, the marsh that existed at the mouth of Mud Lake Ditch was filled in with material dredged from the lake. The northeastern shoreline was developed in the late 1960's and was originally used for pasture land. Three channels have been excavated at the north end of the lake for access to new development.

1.2 Reason and Purpose for the Project

Since the late 1970s the water quality and general condition of Shipshewana Lake has declined dramatically. In 1986 the lake was classified as a *Class Three Lake*, which is considered an advanced eutrophic lake of the lowest quality (Indiana Department of Environmental Management, Indiana Lake Classification System and Management Plan). It was classified this way due to a total phosphorus concentration of 0.045 mg/l and a Secchi disc transparency of 3 feet. A Eutrophication Index value of 51 was calculated for the lake (scale 0-75). In addition, extreme blue-green algae blooms are common during the growing season resulting in Secchi disc transparency readings of .5 feet.

A thick, unconsolidated layer of organic sediment exists on the lake bottom all year round. During peak growing season anoxic conditions persist in this layer as well as in the water column above it. As a result, lake use has suffered, swimming has been banned, boating is hampered due to algae scums and fishing has declined. The receiving streams (Page Ditch, Pigeon River) are impacted as well.

This entire project proposes several Best Management Practices (BMPs) to address water quality problems: shoreline stabilization, dredging, and two constructed wetlands. The constructed wetlands will provide better water quality by removing sediments, nutrients, and other pollutants by means of settling, filtration, and biological processes. This treatment option provides excellent removal of pollutants while requiring minimal operational attention.

1.3 School Site Constructed Wetlands

The existing constructed wetland area in the rear of the Shipshewana Elementary School is unsatisfactory for the treatment of urban stormwater from its 50 acre watershed (see Figure 1: Photos 1 and 2). This system will be reconstructed and enlarged to provide adequate treatment with



Photo 1: View of the existing school wetland.



Photo 2: View of the existing school wetland.

relatively simple, low-cost maintenance. A sediment forebay is needed to settle suspended particles from incoming stormwater to prevent clogging of the entire system. This forebay will be sized accordingly for accessible, periodic removal of accumulated sediments by small equipment. The remainder, and largest portion of the wetland system, will be enlarged and vegetated. This portion will be responsible for the biological removal of nutrients and other pollutants, as well as the further settling of fine suspended particles. An example of a typical sediment forebay followed by a wetland treatment system is shown in Figure 2.

The existing wetland is approximately 1.2 acres in size and consists of a mud flat area surrounded by wetland vegetation. This wetland system does not function well to remove sediments and nutrients from the stormwater directed to the site. Based on the methodology for sizing wetlands presented by Schueler, 1992, the area needed to provide adequate treatment for the 50 acres draining to the existing stormwater management facility located behind the school is 0.5 acres. This area was calculated assuming that the 50 acres drainage area is approximately 90 percent impervious. The 6 month, 24 hour storm volume was calculated to be 1.7 inches using information provided in the Soil Conservation Services TR-55 Model and in "Constructed Wetlands for Storm Runoff Water Quality Control" (Horner, 1993). Since approximately 4.0 acres is available at the school site for a constructed wetland system, this is a feasible site. Based on the calculations, the constructed wetland only needs to be 0.5 acres; however, if the wetland system is designed to be larger and have a longer hydraulic residence time, the pollutant removal efficiencies will increase, and more dissolved pollutants such as nitrogen and phosphorus will be removed (Horner, 1993).

The existing 1.2 acre wetland will be replaced with a 2 acre constructed wetland that will consist of a forebay to settle out large solids, a wetland zone to remove smaller sediments and nutrients, and a micro-pool (exit pond) to remove additional suspended matter. The design of the wetland system also includes an emergency bypass for larger storms so that the wetland system is not washed out.

1.4 Sara Davis Ditch Constructed Wetlands

The Sara Davis Ditch which flows from Cotton Lake to Shipshewana Lake is a county regulated drainage way south of Route 250. A 600 foot section of this "ditch" adjacent to and south of Route 250 currently serves as a water conveyance channel and provides no pollutant removal. In fact, the current erosion of this ditch during storm flows is contributing nutrient and sediment pollution to Shipshewana Lake. A properly designed constructed wetland system in this area would be capable of removing high concentrations of nutrients, suspended particles, and other pollutants from approximately 2,100 acres of the Shipshewana Lake watershed. The drainage easement is 150 feet wide at this site; therefore, a 2.1 acre area is available for a constructed wetland system.

The wetland area required for treating the drainage from the 2,100 acre watershed to the Sara Davis Ditch site is 15 acres based on standard calculations for sizing wetlands. However, the topography and peaking factors for this agricultural portion of Indiana are significantly different than average conditions, and standard runoff equations do not adequately reflect the actual runoff in the area. According to Rex Pranger, LaGrange County Engineer, there is significant depression storage within the watershed by natural depressions, man-made farm ponds, and Cotton Lake; therefore, the time of concentration to the Sara Davis Ditch location is extremely long and storm peaks are spread out

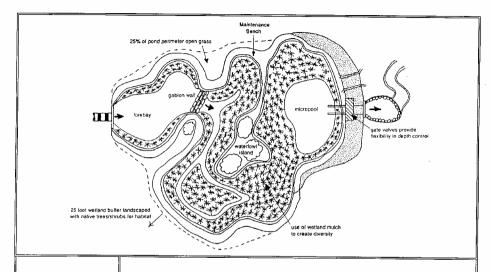


Figure 2

Typical Forebay Constructed Wetland System (from Schueler 1992)

over time. Mr. Pranger indicated that the water level in the Sara Davis Ditch at the proposed wetland site does not increase significantly during storm events. Occasionally during a very large storm event or during a high snow melt event, the water in the Sara Davis Ditch only slightly overflows its banks. Based on this information and on our field evaluation of this site, we feel that the 2.1 acre area that is available at this site would be adequate for a constructed wetland treatment system.

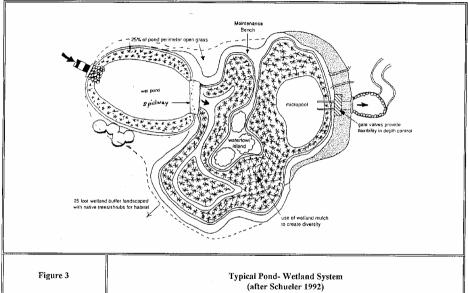
A 1.7 acre pond-wetland system specifically for the removal of agricultural associated pollutants will be constructed in the Sara Davis Ditch. An enlarged sediment forebay will be installed to enhance the removal of suspended particles. The remaining portion of the system will be vegetated for the biological removal of nutrients and other pollutants. Instead of a single channel running uncontrolled through the area, the system will detain and control storm flows, evenly discharging water to a densely vegetated, meandering system. See Figure 3 for a typical pond-wetland system. Treatment is essential at this location since there is significant agricultural activity in this portion of the watershed. Fertilizing and soil disturbance associated with farming methods used by local farming operations introduces high concentrations of sediments and nutrients to the Sara Davis Ditch. There was some concern expressed throughout the review process regarding the projects impact on the 100 year flood plain. The system was modeled using HEC-RAS to determine the extent of these impacts. The model showed that the water surface elevation within the construction area will be lower since the wetland system will create more depression storage.

2.0 Regulatory Processes and Administration

2.1 Permit Descriptions

The following permits applications have been or will be submitted. Pertinent information regarding permit status is as follows:

- An Army Corps of Engineers individual permit application (33 CFR 325) for the lake dredging and the constructed wetlands has been submitted. Initial comments were addressed and the Public Notice was issued on December 17, 1997. The application is now being reviewed by the ACOE and permit approval is expected by April 24, 1998. The application and all relevant correspondence is included in Appendix C-1.
- An IDNR Division of Water, Flood Control Act Permit application for the Sara Davis Ditch constructed wetland has been submitted. As a part of the IDNR permit application process, all Sara Davis Ditch landowners and adjoining landowners were notified about the project by certified mail in August 1997. Comments have been received from the agency and additional information which was requested has been submitted. The application and public notice is included in Appendix C-2.
- We received Indiana Department of Natural Resources (IDNR), Division of Historic Preservation and Archeology clearance on January 30, 1997. The approval letter is included in Appendix C-3.



- We received IDNR, Division of Nature Preserves clearance on September 26, 1996. The approval letter is included in Appendix C-3.
- The preliminary plans were submitted to the LaGrange County Drainage Board for review in August 1997. The approval letter is included in Appendix C-3.

2.2 Erosion Control

The following stages of earth moving were included on the Erosion and Sedimentation Control Plans in addition to the standard erosion and sediment control notes. These plans will be followed by the Shipshewana Lake Improvement Association and their chosen contractors:

SHIPSHEWANA ELEMENTARY SCHOOL CONSTRUCTED WETLANDS STAGES OF EARTH MOVING ACTIVITIES

- 1. Drain existing pond. Remove existing deck and save for later reinstallation.
- Construction Entrances shall be installed where indicated on plans.
- Silt fence shall be installed down-grade of all earth disturbance activities and where indicated on plans.
- Adjust existing pipe lengths and install sediment forebay as specified and designated on the plans. Install rock filter at spillway location.
- Install outlet riser and micropool as specified and designated on the plans. Cover overflow orifice(s) until site is stabilized. Gate valve for reverse slope Extended Detention pipe shall remain open. Install rock filter at emergency spillway location.
- Clear and grub wetland area. Existing trees specified by the school district shall be removed and preserved for future use. Grade area as specified and designated on plans.
- 7. Install all wetland landscaping and seeding as specified and designated on plans.
- Relocate existing deck as specified and designated on plans. Install fencing and gates as specified and designated on plans. Replant preserved trees as specified and designated on plans.
- After site has stabilized, remove excess sediments from forebay and micropool. Stabilization shall be considered 75% or more vegetative cover. Sediment shall be disposed of in an approved upland location. Remove rock filters and outlet covers.
- Remove all remaining erosion and sediment control devices. All disturbed areas from said removal shall be immediately seeded and mulched.

SARA DAVIS DITCH CONSTRUCTED WETLANDS STAGES OF EARTH MOVING ACTIVITIES

- All work shall be done during periods of low or no flow. Stream shall be diverted as necessary to perform the work.
- Construction Entrance shall be installed where indicated on plans.
- Install sediment forebay as specified and designated on the plans. Install rock filter at spillway location.
- 4. Install outlet riser and micropool as specified and designated on the plans. Cover overflow orifice(s) until site is stabilized. Gate valve for reverse slope Extended Detention pipe shall remain open. Install rock filter as specified and designated on plans.
- Clear and grub wetland area. Grade area as specified and designated on plans. Excess cut
 material shall be used to fill western slope at owner's direction. This fill area shall be seeded
 with sedge grasses or other erosion-resistant grass species.
- Install all wetland landscaping and seeding as specified and designated on plans. Install fencing around wetland as per plans and specifications.
- After site has stabilized, remove excess sediments from forebay and micropool. Stabilization shall be considered 75% or more vegetative cover. Sediment shall be disposed of in an approved upland location. Remove rock filters and outlet covers.
- Remove all remaining erosion and sediment control devices. All disturbed areas from said removal shall be immediately seeded and mulched.

2.3 Maintenance Plan

The operation and maintenance requirements for constructed wetlands are minimal. The system is designed to operate without human input. Some reseeding of the slopes or replanting of emergent vegetation or woody plant material will take place as needed until the area is stabilized. The plants will become established and virtually maintenance free within approximately one growing season. Once the plant material is established the only required maintenance will be the periodic cleaning of the sediment forebays and the micropools. These requirements are further detailed in Section 2.5 Post Construction Monitoring.

2.4 Inspections

We are still awaiting an IDNR permit. However, we have heard from the Agency verbally in regard to required inspection and monitoring requirements. To meet permit requirements, the Shipshewana Community Lake Improvement Association will inspect project performance. The Association will also take photographs of the area and submit them to IDNR. In addition, the LaGrange County Soil and Water Conservation District must be notified 48 hours before the project begins. Inspection visits by that Agency are expected.

2.5 Post Construction Monitoring

The purpose of this monitoring program is to verify that the constructed wetlands are performing the functions for which they were designed. The monitoring should be performed by personnel who are familiar with wetlands in general and their ecological functions, familiar with the design objectives of the constructed wetlands system, and familiar with the identification of wetland plant species. The monitoring would involve visual inspection and chemical testing.

The visual inspection component of the monitoring program will involve the following:

- A. Inspection of the structural integrity of the channels, berms, water level control structure, and the erosion control measures. The following factors will be examined to verify the structural integrity:
 - Human activity and vandalism including but not limited to riding horses and off-road vehicles in the wetland areas, damage to or destruction of the outlet structure, etc.
 - Animal activity including but not limited to the burrowing of groundhogs, beavers or muskrats
 - 3. Erosion of banks, channels, etc.
 - 4. Tampering with the outlet control structures
- B. Inspection and assessment of the vegetative community in the constructed wetlands as an indicator of the health of the wetlands system. The inspection should identify the location and quantities of all wetland plant species, herbaceous cover, shrubs, and trees. The quantitative and qualitative information must be recorded to measure the maturation of the constructed wetland. A site map from the project plans can be used as a base map for recording the location and quantity of the vegetative communities.
- C. The sediment build-up in the forebay and micropool should be monitored. The depth of water during normal flow can be determined at a set location, preferably midway between inlet and outlet of the pool. This location can be marked with a stake for future reference. Subsequent measurements should be taken at the same location and compared to the initial measurement. The depth of silt is approximately be the difference between the initial and current depth of water.

Many parameters of chemical testing may be routinely measured in monitoring programs where ample funding and expertise are available. Most of these parameters are measured for reasons mor academic than utilitarian. The 1988 EPA <u>Lake and Reservoir Restoration Guidance Manual</u> has a section on post-monitoring of lake restoration projects. The guidance manual contains a table listing a sampling protocol for overall lake monitoring that can be applied to the wetland system. If information on

additional parameters are deemed necessary, F. X. Browne, Inc. staff members are available to work with the Lake Association to redefine the monitoring objectives.

The wetlands monitoring should be performed on a regular basis with the structural inspections being performed quarterly. The growth of dominant vegetation should be well established by July. The assessment of the vegetative community, therefore, should take place during this month. The reporting of field measurements and conditions should be done on a standard form (Appendix D). The field data sheets should then be copied and stored in a binder for annual compilation and analysis.

3.0 Constructed Wetland Design

3.1 Hydrology and Hydraulics

The hydrology for the sites was calculated using US Soil Conservation District, Technical Release No. 55 (TR-55) for small watersheds. The peak runoff calculations were based on an SCS Type II, 24-hour storm event. The curve numbers (CN) and times of concentration (Tc) were determined from known land use and modified by observed conditions.

Since the design of constructed wetlands is a relatively new process, there are no industry standards on which to base the design. The methodology for sizing wetlands presented by Schueler, 1992 was used to determine the relative areal and volumetric sizes of the separate wetland areas including forebay, high marsh, low marsh, and micropool. The outlet structures were then designed to allow for an extended detention time of 1 to 2 days to provide adequate treatment. Appendix B contains the results of the design calculations.

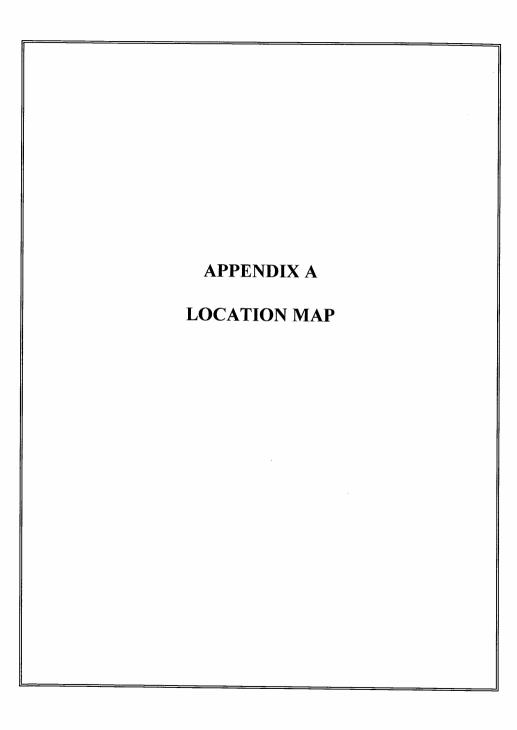
3.2 Land Rights

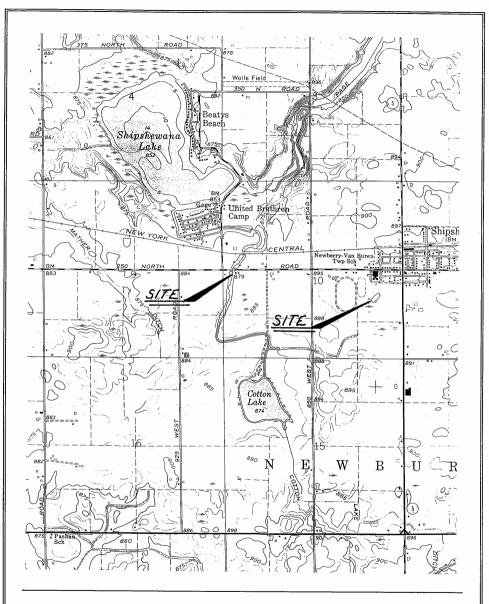
The pond-wetland system proposed for Sara Davis Ditch will be within an existing drainage easement. All required permits and notifications will be obtained prior to the commencement of construction activities. The school wetlands site will be at the existing pond located at the Newbury-Van Buren School. Easements for the use of this site are being obtained by the Shipshewana Community Lake Improvement Association.

3.3 Construction Cost Estimate

The Construction Cost Estimate Summary is listed below. See Appendix E for the full cost estimate.

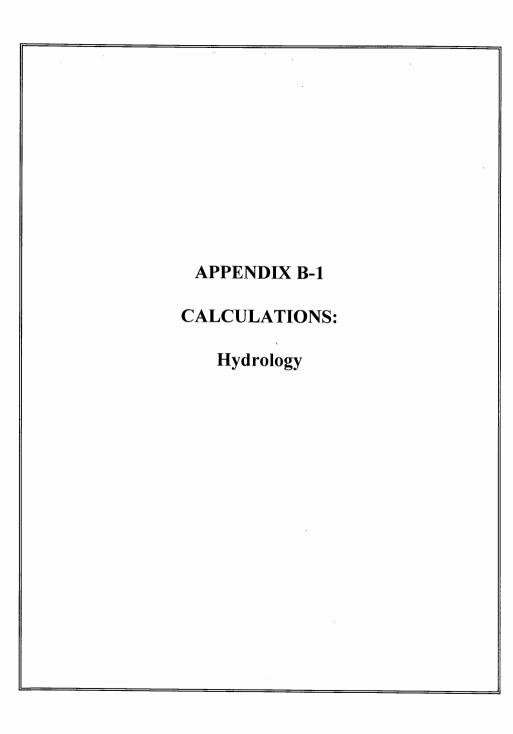
Constructed Wetlands	Cost
Construction - School Wetland School Wetland School Wetland Construction Inspection & Engineering Construction Administration	57,547 7,500
TOTAL\$	142.471





LOCATION MAP

U.S.G.S. Shipshewana, IN Quadrangle Scale 1" = 2000'



RUNOFF CURVE NUMBER COMPUTATION

Project: Shipshewana Lake Association County: LaGrange State: IN Subtitle: Shipshewana Elementary School	Checked:	Date:	
COVER DESCRIPTION	A .	logic Soil Gr 3 C Acres (CN)	oup D
FULLY DEVELOPED URBAN AREAS (Veg Estab. Open space (Lawns, parks etc.) Good condition; grass cover > 75%	·	- 11.8(74)	_
Impervious Areas Paved parking lots, roofs, driveways		- 16.2(98)	-
Residential districts Avg % imperv (by average lot size) 1/8 acre (town houses) 65 1/2 acre 25	<u>.</u> :	- 12.8(90) - 4.8(80)	-
Total Area (by Hydrologic Soil Group)		==== 45.6	
TOTAL DRAINAGE AREA: 45.6 Acres*	WEIGHTED	CURVE NUMBER	: 88*

GRAPHICAL PEAK DISCHARGE METHOD

		* Acres	Runoff CN : 88 *
Time of Concentration:	0.25	Hours	Rainfall Type : II
Pond and Swamp Area :	1.76	Acres	3.9 % of Drainage Area

Storm Number	1	2	3	4	 5	6
Frequency (yrs)	2	5	10	25	50	100
24-Hr Rainfall (in)	2.67	3.36	3.90	4.43	4.92	5.30
Ia/P Ratio Used	0.10 0.10	0.08 0.10	0.07 0.10	0.06 0.10	0.06 0.10	0.05 0.10
Runoff (in)	1.53	2.14	2.64	3.13	3.59	3.95
Unit Peak Discharge (cfs/acre/in)	1.141	1.143	1.143	1.143	1.143	1.143
Pond and Swamp Factor 5.0% Ponds Used	0.72	0.72	0.72	0.72	0.72	0.72
Peak Discharge (cfs)	57	80	99	117	135	148

RUNOFF CURVE NUMBER COMPUTATION

Project : Shipshewana - Sara Davis Ditch County : Lagrange State: IN Subtitle: runoff to Sara Davis Ditch	
COVER DESCRIPTION 7	Hydrologic Soil Group A B C D
FULLY DEVELOPED URBAN AREAS (Veg Estab.) Impervious Areas Paved parking lots, roofs, driveways	
OTHER AGRICULTURAL LANDS Pasture, grassland or range fair -	609(79) -
Total Area (by Hydrologic Soil Group)	640 =====
TOTAL DRAINAGE AREA: 640 Acres V	
Flow Type 2 year Length Slope Surface rain (ft) (ft/ft) code	e n Area Wp Vel. Time (sq/ft) (ft) (fps) (hr)
Sheet 2.67 150 0.005 b Shallow Concent'd 2150 0.009 u Open Channel 8100	0.179 0.390 0.50 4.500
	Time of Concentration = 5.07*
Sheet Flow Surface Codes A Smooth Surface F Grass, Dense B Fallow (No Res.) G Grass, Burmud C Cultivated < 20 % Res. H Woods, Light D Cultivated > 20 % Res. I Woods, Dense E Grass-Range, Short J Range, Natura	P Paved

^{* -} Generated for use by GRAPHIC method

GRAPHICAL PEAK DISCHARGE METHOD

Project: Shipshewana - Sara Davis Ditch User: skd Date: 05-28-97 County : Lagrange State: IN Checked: ___ Date: ____

Subtitle: runoff to Sara Davis Ditch

Data: Drainage Area : 640 * Acres Runoff Curve Number : 80 *

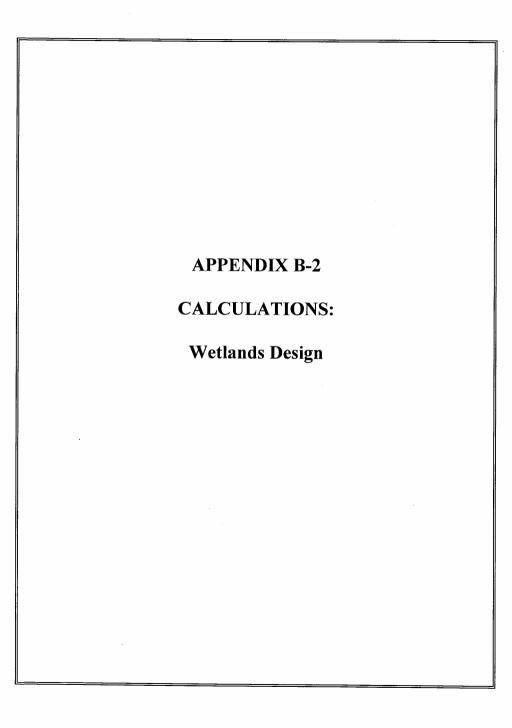
Time of Concentration: 5.07 * Hours

Rainfall Type : II

Pond and Swamp Area : 10.4 Acres 1.6 % of Drainage Area

Storm Number	 1	2	= == =================================	 4	= ==== ===============================	====== 6
Frequency (yrs)	2	5	10	25	50	100
24-Hr Rainfall (in)	2.67	3.36	3.90	4.43	4.92	5.30
Ia/P Ratio	0.19	0.15	0.13	0.11	0.10	0.09
Used	0.19	0.15	0.13	0.11	0.10	0.10
Runoff (in)	1.01	1.53	1.96	2.40	2.82	3.16
Unit Peak Discharge (cfs/acre/in)	0.160	0.164	0.167	0.169	0.170	0.171
Pond and Swamp Factor 1.0% Ponds Used	0.87	0.87	0.87	0.87	0.87	0.87
Peak Discharge (cfs)	90	140	182	226	268	300

^{* -} Value(s) provided from TR-55 system routines



Shipshewana Lake Association Constructed Wetlands Elementary School Site - Extended Detention Wetland Maximum Area Sizing FXB Project No. IN1337-02 Watershed area to constructed wetland (A) = 47 acres Percent shallow surface area required = Design min. - 2% Minimum shallow surface area = 0.94 acres Available shallow surface area (SA) = 25 acres Storm Runoff Coefficient (Rv) Rv = 0.5 + 0.009(I) 47.00 acres Rv = 1.01702128 27 00 acres I = 57.4468085106 % Treatment Volume (Vt) Assume a design maximum rainfall of 1.25" Vt = [(1.25)(Rv)(A)/12](43,560) Rv = 1.0170212766 A = 47.00 acres Vt = 216,893 ft^3

Note: The minimum Vt should be 0.25 watersed-inches

Extended Detention Criteria Based on Available Surface Area

Percent of su	rface area:			SA=	2.50	acres	=	108,900	ft^2
	Forebay	5	%	=	0.13	acres	=	5,445	ft^2
	Micropool	5	%	=	0.13	acres	=	5,445	ft^2
	Deep Pool	0	%	=	0.00	acres	=	0	ft^2
	Low Marsh	40	%	=	1.00	acres	=	43,560	ft^2
	High Marsh	40	%	=	1.00	acres	=	43,560	ft^2
	Semi-wet	10	%	=	0.25	acres	=	10,890	ft^2
	Total Area				2.50	acres	-	108,900	ft^2
Percent of tre	eatment volume:			Vt =	216,893	ft^3			
	Forebay	10	%	=	21,689	ft^3			
	Micropool	10	%	≡	21,689	ft^3			
	Deep Pool	0	%	=	0	ft^3			
	Low Marsh	20	%	=	43,379	ft^3			
	High Marsh	10	%	=	21,689	ft^3			
	Semi-wet	50	%	=	108,446	ft^3			
	Total Volume				216,893	ft^3			

FOREBAY SIZING

Design Depth = 6ft

Volume of Forebay =

21,689 ft^3

Depth = 6.00 ft

Surface Area of Forebay=

5,445 ft^2

Dimensions of a cylinder 6 ft high with a volume of:

21,689 ft^3

Formula: V=hXpi(r^2)

Radius = 33.9212386687 ft

Area = 3,614.88 ft^2

Sizing:

TRUNCATED CONE

V = Z1-Zo\3 (Ao + A1 + (AoA1)^0.5)

Bottom Radius 25.577 ft

IN COLUMNS L & M

Sideslope 2.6755 ft

NTERVAL		AREA	RADIUS	AREA	Z1-Zo	(Ao*A1)^0.5	Ao+A1	VOLUME	TOTAL VOL
	(FT)			(FT2)	(FT)			(FT3)	(FT3)
Zo	0	Ao	25.5770	2055.18					
Z1	1	A1	28.2525	2507.63 .	1	2,270.16	4,562.81	2,277.63	21,689.40
Z2	2	A2	30.9280	3005.06	1	2,745.10	5,512.69	2,752.57	
Z3	3	A3	33.6035	3547.47	1	3,265.02	6,552.53	3,272.49	
Z4	4	A4	36.2790	4134.86	1	3,829.92	7,682.33	3,837.38	
Z 5	5	A5	38.9545	4767.22	1	4,439.79	8,902.08	4,447.25	
Z6	6	A6	41.6300	5444.56	1	5,094.64	10,211.78	5,102.09	

TOTAL VOLUME 21,689 ft^3 TOTAL VOLUME REQUIRED 21,689 ft^3 SURFACE AREA 5,445 .ft^2 SURFACE AREA REQUIRED 5,445 ft^2

LOW MARSH SIZING

ITERATIONS

Design Depth = 15 inches

Design Volume of Low Marsh =

43 379 ft^3

Design Surface Area of Low Marsh=

43,560 ft^2

Calculated Depth =

0.008 6

Surface Area Based on Design Depth =

34,703 ft^2

0.797 acres

Use the Lower Value of the Surface Areas, as Based on Design Depth vs. Calculated Depth Any Remainder of the Surface Area Should be Added to the High Marsh Surface Area

Design Surface Area of Low Marsh =

Selected Surface Area of Low Marsh =

43.560 ft^2 34,703 ft^2

Remainder of Surface Area =

8,857 ft^2

HIGH MARSH SIZING

ITERATIONS

Design Depth = 6 inches

Volume of Low Marsh =

21,689 ft^3 Design Depth= D.50 n

Surf. Area of Low Marsh=

43,560 ft^2

Calculated Depth =

0.498 ft

Surface Area Based on Design Depth =

43,379 ft^2

0.996 acres

Use the Higher Value of the Surface Areas, as Based on Design Depth vs. Calculated Depth

Selected Surface Area of High Marsh =

43,560 ft^2

Remainder of Low Marsh Surface Area =

8.857 ft^2

Total Surface Area of the High Marsh =

52,417 ft^2

SEMI-WET AREA

ITERATIONS

NOTE:

For Calculations, the Surface Area for the Semi-Wet Area is the Total Area Above the Normal Pool Elevation Therefore, the Total Available Surface Area at the Constructed Wetland Should be Used

Design Depth = 0 to 24 inches above the normal pool elevation

Design Volume of Semi-Wet Area = Design Surface Area of Semi-Wet Area ≈

108,446 ft^3 Design Depth ≈ 10,890 ft^2



Use the Total Available Surface Area =

108,900 ft^2

Calculated Depth =

0.996 ft

Surface Area Based on Design Depth =

Use the Total Available Surface Area =

54,223 ft^2 108,900 ft^2 1.24 acres 2.50 acres

Use the Total Available Surface Area. This area of the wetland is only for extended detention puproses, and therefore, the maximum possible volume should be used. A lower value could be used if necessary...there will be no effect on the wetland hydrology for the normal pool.

MICROPOOL SIZING

Design Depth = 4ft

Volume of Micropool= Surface Area of Micropool= 21,689 ft^3 5,445 ft^2

Depth = 4.90 ft

Dimensions of a cylinder 4 ft high with a volume of:

21,689 ft^3

Formula: V=hXpi(r^2)

Radius = 41.5448630908 ft

5,422.31 ft^2

Sizing:

TRUNCATED CONE

V = Z1-Zo\3 (Ao + A1 + (AoA1)^0.5)

Bottom Radius = 41.459 ft

IN COLUMNS L & M

0.043 ft:1 ft

INTERVAL	INTERVAL DEP1 (FT)	AREA	RADIUS	AREA (FT2)	Z1-Zo (FT)	(Ao*A1)^0.5	Ao+A1	VOLUME_ (FT3)	TOTAL VOLU (FT3)
Zo	0	Ao	41.4590	5399.92					
Z1	1	A1	41.5020	5411.13	1 -	5,405.52	10,811.05	5,405.47	21,689.21
Z2	2	A2	41.5450	5422.35	1	5,416.74	10,833.48	5,416.68	21,009.21
Z3	3	A3	41.5880	5433.58	1	5,427,96	10,855,93	5,427.91	
Z4	4	A4	41.6310	5444.82	1	5,439.20	10,878.40	5,439.14	
TOTAL VOL	UME	21,689 ft	^3						
TOTAL VOL	UME REQUIRED	21,689 ft	^3						
SURFACE A	AREA	5,445 ft	^2						
SURFACE A	AREA REQUIRED	5,445 ft	^2						

Shipshewana Lake Association Shipshewana Elementary School Wetland FXB Project No. IN1337-02

EXTENDED DETENTION DRAWDOWN TIME

Elevation	Area	Avg Area	d Elevation	Storage	d Storage	Discharge	Average	Time	Accum.
				Volume	Volume		Discharge		Time
(ft)	(sq.ft.)	(sq.ft.)	(ft)	(cu.ft)	(cu.ft)	(cfs)	(cfs)	(hrs)	(hrs)
86.00	36,837			29,000		0.67			0.00
		29,820	0.50		14,910		0.55	7.54	
85.50	22,804			14,089		0.43			7.54
		15,787	0.50		7,893		0.33	6.56	
85.00	8,770			6,196		0.24			14.10
		7,483	0.50		3,742		0.16	6.52	
84.50	6,196			2,455		0.08			20.61
		4,909	0.50		2,455		0.04	16.37	
84.00	3,622			. 0		0.00			36,98
								days	1.54

Shipshewana Lake Association Constructed Wetlands Sara Davis Ditch - Extended Detention Wetland Minimum Area Sizing FXB Project No. IN1337-02

Watershed area to constructed wetland (A) =

630 acres

Percent shallow surface area required =

Design min. - 2%

Minimum shallow surface area =

1.06 acres

Available shallow surface area (SA) =

Storm Runoff Coefficient (Rv)

Rv = 0.5 + 0.009(I)

A =

53.00 acres

Rv = 0.50169811

Q (O acres

I = 0.188679245 %

Treatment Volume (Vt)

Assume a design maximum rainfall of 1.25"

Vt = [(1.25)(Rv)(A)/12](43,560)

Rv = 0.501698113

120.652 ft^3

53.00 acres

Note: The minimum Vt should be 0.25 watersed-inches

Extended Detention Criteria Based on Available Surface Area

Percent of surface area:			SA= 1.06	acres	=	46,174	ft^2
Forebay	42	%	= 0.45	acres	=	19,393	ft^2
Micropool	8	%		acres	=	3,694	ft^2
Deep Pool	0	%		acres	=	0,034	ft^2
Low Marsh	25	%		acres	=	11,543	ft^2
High Marsh	25	%		acres	=	11,543	ft^2
** Semi-wet	0	%		acres	=	25,700	ft^2
Total Area	100	%	1.65	acres	=	71,874	ft^2
Percent of treatment volume:			Vt = 120,652	ft^3		Average [Depth
Forebay	63.3	0/				Requir	
Micropool			· ·	ft^3		3.94	ft
•	12.5		= 15,082	ft^3		4.08	ft
Deep Pool		%	= 0	ft^3			ft
Low Marsh	15	%	= 18,098	ft^3		1.57	ft
High Marsh	5	%	= 6,033	ft^3		0.52	ft
** Semi-wet	4.2	%	= 51,400	ft^3		2.00	
Total Volume	100	%	166,985	ft^3			

^{**} Not included in the 1.06 ac surface area; nor in the treatment volume.

FOREBAY SIZING

Volume of Forebay =

Surface Area of Forebay=

76,373 ft^3 19,393 ft^2

Depth = 800 ft

Elevation	Area	Avg Area	d Elevation	Storage Volu	ume (cu.ft.)
(ft)	(sq.ft.)	(sq.ft.)	(ft)	Incremental	Total
861.00	6,746				0
		7,626	1.00	7,626	
862.00	8,506				7,626
		9,544	1.00	9,544	
863.00	10,581				17,170
		11,606	1.00	11,606	
864.00	12,631				28,776
		13,669	1.00	13,669	·
865.00	14,706				42,445
		15,847	1.00	15,847	
866.00	16,988				58,293
		18,187	1.00	18,187	
867.00	19,385				76,479

MICROPOOL SIZING

Volume of Micropool=

Surface Area of Micropool=

15,082 ft^3

3,694 ft^2

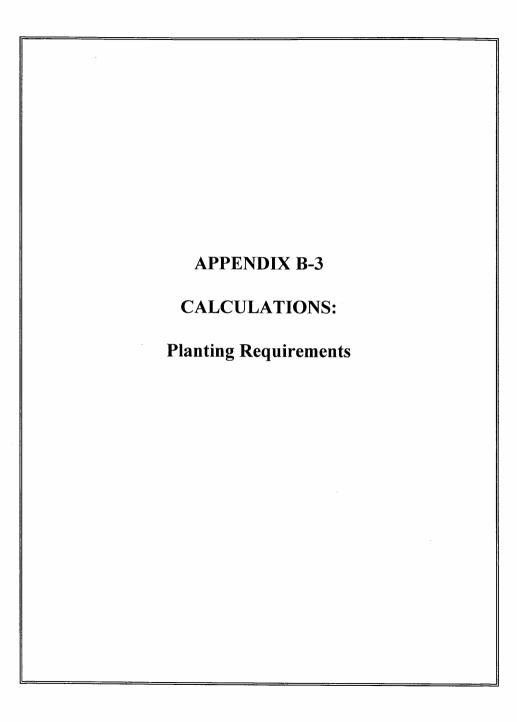
Depth = # 00 ft

Elevation	Area	Avg Area	d Elevation	Storage Volu	ıme (cu.ft.)
(ft)	(sq.ft.)	(sq.ft.)	(ft)	Incremental	Total
858.00	1,430				0
		1,600	1.00	1,600	
859.00	1,770				1,600
		1,935	1.00	1,935	
860.00	2,100				3,535
		2,278	1.00	2,278	
861.00	2,456				5,813
		2,646	1.00	2,646	
862.00	2,836				8,459
		3,122	1.00	3,122	
863.00	3,408				11,581
		3,602	1.00	3,602	
864.00	3,795				15,183

Shipshewana Lake Association Sara Davis Ditch Wetlands FXB Project No. IN1337-02

EXTENDED DETENTION DRAWDOWN TIME

Elevation	Area	Avg Area	d Elevation	Storage	d Storage	Discharge	Average	Time	Accum.
] .	Volume	Volume	_	Discharge		Time
(ft)	(sq.ft.)	(sq.ft.)	(ft)	(cu.ft)	(cu.ft)	(cfs)	(cfs)	(hrs)	(hrs)
869.00	74,400			169,929		4.68			0.00
		62,058	2.00		124,116		3.43	10.05	
867.00	29,281			45,814		2.18			10.05
		26,892	0.50		13,446		1.92	1.95	
866.50	24,503			32,368	l	1.66			12.00
		22,113	0.50		11,057		1.42	2.16	
866.00	19,724			21,311		1.18			14.16
		17,151	0.50		8,576		0.98	2.44	
865.50	14,578			12,736		0.77			16.60
		12,005	0.50		6,003		0.59	2.81	
865.00	9,432			6,733		0.42			19.41
		8,083	0.50		4,041		0.28	3,96	
864.50	6,733			2,692		0.15			23,37
		5,384	0.50		2,692		0.07	10.10	
864.00	4,034			0		0.00			33.46
								days	1.39



Shipshewana Lake Association Constructed Wetlands - Planting Specifications Elementary School Site - Extended Detention Wetland FXB Project No. IN1337-02

Surface area of each component:

Component	Percent of Total Surface Area			Area (a	(acres)		Area (square fe	
Total (A)	100	%	=	2.50000	acres	=	108,900	ft^2
Forebay	5	%	=	0.12500	acres	=	5.445	ft^2
Micropool	5	%	=	0.12500	acres	=	5,445	ft^2
Deep Water	0	%	=	0.00000	acres	=		ft^2
Low Marsh	40	%	=	1.00000	acres	=		ft^2
High Marsh	40	%	=	1.00000	acres	=	43,560	ft^2
Semi-wet	10	%	=	0.25000	acres	=	10.890	ft^2

General Considerations:

No plantings in the Forebay or Micropool

Juncus Efussus and Eleocharis sp. in Semi-wet Area

The entire wetland will be seeded with a wetland seed mixture (WSM)

2 primary species in each "marsh" zone (2/3 of total plantings)

3 secondary species as selected in each "marsh" zone (1/3 of total plantings)

Selected plant species for:

Low Marsh Area (6-18 inches below normal water surface)

Low Marsh Area 43.560 ft^2 Spacing (from center) 2.5 ft^2 Total Number of Plants = 17.424 units

Primary Species: Fraction of total Total units Duck Potato Sagittaria latifolia 0.3333 ====> 5,808 units Pickerelweed Pontedaria cordata 0.3333 ====> 5,808 units Secondary Species: Fraction of total Total units Arrrow Arum Peltandra virginica 0.1111 =====> 1.936 units Softstern Bulrush Scirpus validus 0.1111 ====> 1.936 units Wild Rice Zizania aquatica 0.1111 ====> 1,936 units

Total (primary and secondary)

17,424 units

17,424 units

39,204 units

High Marsh Area (0-6 inches below normal water surface)

High Marsh Area 43,560 ft^2 Spacing (from center) 2.5 ft^2 Total Number of Plants 17,424 units

Primary Species: Fraction of total Total units Softstern Bulrush Scirpus Validus 0,3333 ====> 5,808 units Common Three-Square Scirpus pungens 0.3333 ====> 5.808 units Secondary Species: Fraction of total Total units Reed Canary Grass Phalaris arundinacea 0.1111 ====> 1,936 units Blue Flag Iris fris versicolor 0.1111 ====> 1.936 units Rice Cutgrass Leersia oryzoides 0.1111 ====> 1.936 units

Semi-wet Area (saturated area above the normal pool elevation)

Total (primary and secondary)

Semi-wet Area 10,890 ft^2 Spacing (from center) = 2.5 ft^2 Total Number of Plants = 4,356 units

Species:	Fraction of total	Total units
Soft Rush Juncus effussus Woolgrass Sairpus cyperinus	0.5000 =====> 0.5000 =====>	2,178 units 2,178 units
Total (primary and secondary)		4,356 units
TOTAL		39 204 unite

ELEMENTARY SCHOOL SITE Plant Summary

Area	Species			
	Duck Potato	Sagittaria latifolia	0.3333333 =====>	5,808 units
Low	Pickerelweed	Pontedaria cordata	0.3333333 ====>	5,808 units
Marsh	Arrrow Arum	Peltandra virginica	0.1111111 =====>	1,936 units
Area	Softstem Bulrush	Scirpus validus	0.1111111 ====>	1.936 units
	Wild Rice	Zizania aquatica	0.111111 =====>	1,936 units
	Softstem Bulrush	Scirpus validus	0.3333333 =====>	5,808 units
High	Common Three-Square	Scirpus pungens	0.3333333 =====>	5.808 units
Marsh	Reed Canary Grass	Phalaris arundinacea	0.1111111 =====>	1,936 units
Area	Blue Flag Iris	Iris versicolor	0.1111111 ====>	1,936 units
	Rice Cutgrass	Leersia oryzoides	0.1111111 =====>	1,936 units
Semi-wet	Soft Rush	Juncus effussus	0.5 =====>	2,178 units
Area	Woolgrass	Scirpus cyperinus	0.5 ====>	2,178 units
TOTAL				39,204 units

Shipshewana Lake Association Constructed Wetlands - Planting Specifications Sara Davis Ditch Site - Extended Detention Wetland FXB Project No. IN1337-02

Surface area of each component:

Component	Percent of Total S	Percent of Total Surface Area		Area (acres)		Area (squ	Area (square feet)	
Total (A)	100	%	=	1.7731	acres	= 77,238	ft^2	
Forebay	25	%	=	0.4450	acres	= 19,385	ff^2	
Micropool	5	%	=	0.0871		,		
Deep Water	0	%	=	0.0000		-,	ft^2	
Low Marsh	18	%	=	0.3260		-	ft^2	
High Marsh	18	%	=	0.3250		,		
Semi-wet	33	%	=	0.5900		,		
Total Area				1.7731	acres	= 77,238	ft^2	

General Considerations:

No plantings in the Forebay or Micropool

Juncus Efussus and Eleocharis sp. in Semi-wet Area

The entire wetland will be seeded with a wetland seed mixture (WSM)

2 primary species in each "marsh" zone (2/3 of total plantings)

3 secondary species as selected in each "marsh" zone (1/3 of total plantings)

Selected plant species for:

Low Marsh Area (6-18 inches below normal water surface)

Low Marsh Area	=	•	14,201	
Spacing (from center)		=	25	ft^2
Total Number of Plants		=	5.680	

Primary Species:	Fraction of total	Total units
Duck Potato Sagrana istina Pickeralwand Pontedaria cometa	0 33333 ====> 0 33333 ====>	1,893 units 1,893 units
Secondary Species:	Fraction of total	Total units
Anow Atum Petiandra virginica Softstem Bultush Scirpus veildus Wild Rice Zirania aguatica	01111 ====> 01111 ====> 0.1111 ====>	631 units 631 units 631 units
Total (primary and secondary)		5,680 units

High Marsh Area (0-6 inches below normal water surface)

High Marsh Area	=	14,157	ft^2
Spacing (from center)	=	5	ft^2
Total Number of Plants	=	5.663	unit

Primary Species:	Fraction of total	Total	units
Soffstein Bultush Scirpus validus Common Three-Square Scirpus pungens	0.3333 ====> 0.3333 ====>	1,888 1,888	units units
Secondary Species:	Fraction of total	Total	units
Reed Canary Grass Phalaids annothecea Blue Flag Ins tris versionior Rice Cutgrass Learst- pryzoides	01111 ====> 01111 ====> 01111 ====>	629 62 9 62 9	units units units
Total (primary and secondary)		5.663	units

Semi-wet Area (saturated area above the normal pool elevation)

Semi-wet Area	=	25,700	ft^2
Spacing (from center)	=	2.5	ft^2
Total Number of Plants	=		units

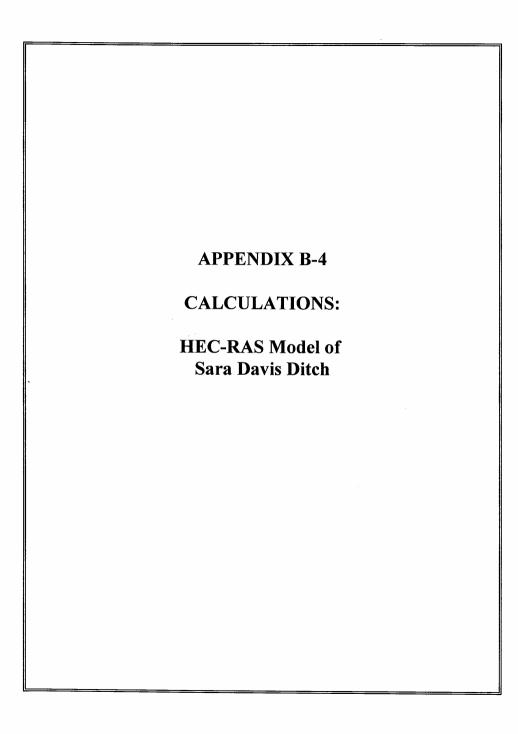
Species:	Fraction of total	Total units		
Soft Rush Jungus effussus Woolgrass Softpus gypennus	0.5000 ====> 0.5000 ====>	5,140 5,140	units units	=
Total (primary and secondary)		10,280	units	
TOTAL		21 623	unita	

21,623 units

Shipshewana Lake Association Constructed Wetlands - Planting Specifications FXB Project No. IN1337-02

Sara Davis Ditch Site Plant Summary

Агеа	Species				
	Duck Potato	Sagittaria latifolia	0.3333 =====>	1.893	units
Low	Pickerelweed	Pontedaria cordata	0.3333 ====>	1.893	units
Marsh	Arrow Arum	Peltandra virginica	0.1111 ====>	631	units
Area	Softstem Bulrush	Scirpus validus	0.1111 =====>	631	units
	Wild Rice	Zizania aquatica	0.1111 =====>	631	units
	Softstem Bulrush	Scirpus validus	0.3333 =====>	1.888	units
High	Common Three-Square	Scirpus pungens	0.3333 =====>	1.888	units
Marsh	Reed Canary Grass	Phalaris arundinacea	0.1111 =====>	629	units
Area	Blue Flag Iris	Iris versicolor	0.1111 ====>	629	units
	Rice Cutgrass	Leersia oryzoides	0.1111 ====>	629	units
Semi-wet	Soft Rush	Juncus effussus	0.5000 ====>	5,140	units
Area	Woolgrass	Scirpus cyperinus	0.5000 ====>	5,140	
TOTAL				21,623	units



HEC-RAS Version 2.1 October 1997 U.S. Army Corp of Engineers Hydrologic Engineering Center 609 Second Street, Suite D Davis, California 95616-4687 (916) 756-1104

X	Х	XXXXXX	XX	XX		XX	XX	X	X	XXXX
Х	Х	x	Х	X		Х	X	Х	х	x
х	Х	X	х			х	Х	Х	х	х
XXXX	XXX	XXXX	Х		XXX	XX	XX	XXX	XXX	XXXX
X	Х	X	x			Х	X	Х	х	х
X	Х	X	Х	X		Х	х	х	x	х
X	X	XXXXXX	XX	XX		х	х	х	х	xxxxx

PROJECT DATA

Project Title: Sara Davis Ditch, Existing

Project File : davis ex.prj

Run Date and Time: 3/31/98 11:52:54 PM

Project in English units

Project Description:

Sara Davis Ditch is an existing stormwater conveyance for Shipshewana Lake in Indiana. The proposed project will construct a wetland along approximately 615 feet of the ditch adjacent to C.R. 250. This model will be performed in two stages, existing condition and proposed condition. The intent is to prove that there is little or no impact to the 100 year flood plain.

PLAN DATA

Plan Title: Plan 01

Plan File : c:\hec-ras\data\davis_ex.p01

Geometry Title: Sara Davis existing

Geometry File : C:\HEC-ras\DATA\davis ex.g01

Flow Title : Sara Davis

Flow File : C:\HEC-ras\DATA\davis_ex.f01

Plan Summary Information:

Number of: Cross Sections = 14 Multiple Openings =

Culverts = 1 Inline Weirs

Bridges 0

Computational Information

Water surface calculation tolerance = 0.01 Critical depth calculation tolerance = 0.01 Maximum number of iterations Maximum difference tolerance = 0.3 Flow tolerance factor = 0.001

Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Sara Davis

Flow File : C:\HEC-ras\DATA\davis ex.f01

Flow Data (cfs)

River <u>100 yr</u> Reach <u>RS</u> 15 Sara Davis Ditch wetlands 400 cfs

Boundary Conditions

River Reach Profile Upstream **Downstream** Sara Davis Ditch wetlands 100 yr Critical Critical

GEOMETRY DATA

Geometry Title: Sara Davis existing

Geometry File : C:\HEC-ras\DATA\davis ex.q01

GENERAL INPUT VALUES

Manning's n Values

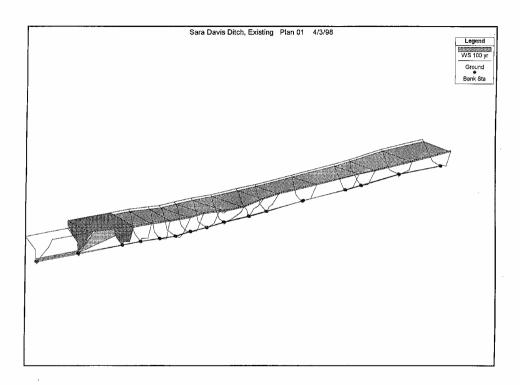
Left Bank 0.04 Channel 0.02 Right Bank 0.04

Coefficient of: Contraction = 0.1 Expansion = 0.3

HEC-RAS Model ver 2.1 Sara Davis Ditch, existing March 31, 1998

Profile Output Table

Reach	River Sta	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
wetlands	15	878.06	878.05	0.00	135.47	40.60	223.94	176.83
wetlands	14	878.06	878.05	0.00	139.00	34.60	226.40	192.02
wetlands	13	878.06	878.05	0.00	191.29	57.15	151.56	166.71
wetlands	12	878.06	878.05	0.00	211.41	56.40	132.18	149.51
wetlands	11.5	878.05	878.05	0.00	172.47	56.05	171.48	147.65
wetlands	11	878.05	878.05	0.00	131.94	74.96	193.10	140.03
wetlands	10	878.05	878.05	0.01	171.94	73.41	154.65	157.47
wetlands	9	878.05	878.05	0.00	193.08	50.69	156.23	197.71
wetlands	8	878.05	878.05	0.00	138.35	46.03	215.62	204.17
wetlands	7	878.05	878.05	0.00	148.91	39.20	211.89	174.32
wetlands	6	878.05	878.05	0.00	179.67	40.67	179.66	184.08
wetlands	5	878.05	878.05	0.00	198.58	38.23	163.20	189.89
wetlands	3	878.05	878.05	0.00	164.50	39.29	196.20	194.93
wetlands	2	Culve	rt					
wetlands	1	870.19	866.53	5.10	34.75	361.62	3.63	20.56



CROSS SECTION R INPUT	IVER: Sara Davis Ditch	REACH	: wetlands	RS: 15
Description: Upstre	am start			
Station Elevation D	ata			
Station	Elevation			
0	879			
32	869			
54	869			
66	868			
68.5	867.2			-
71	868			
121	869			
186	879			
Bank Station: Left	t Right Lengt	hs: Left	Channel	Diale
66		105	105	Right 105
			103	103
•				
CROSS SECTION OUTPUT	Profile #100 yr			
	<u> Element</u>	Left OB	Channel	Right OB
W.S. Elev (ft) 878.0	05			
E.G. Elev (ft) 878.0	06 Reach Len. (ft)	105.00	105.00	105.00
Crit W.S. (ft) 869.	76 Flow Area (sq ft)	445.02	52.27	744.16
E.G. Slope 0.00000	05 Area (sq ft)	445.02	52.27	744.16
Q Total (cfs) 400.0	00 Flow (cfs)	135.47	40.60	223.94
Top Width (ft) 176.8	33 Top Width (ft)	62.97	5.00	108.85
Vel Total (fps) 0.3	32 Avg. Vel. (fps)	0.30	0.78	0.30
Max Chl Dpth(ft)10.8	35 Hydr. Depth (ft)	7.07	10.45	6.84
Length Wtd.(ft)105.0	00 Wetted Per. (ft)	64.40	5.25	109.56
Min Ch El (ft) 867.2	20 Cum SA (acres)	1.83	0.13	1.63

CROSS SECTION RIVER	R: Sara Davis Ditch	n REAC	H: wetlands	RS: 14
Description:				
Station Elevation Data				
Station	Elevation			
0	879			
20	873			
47	871			
76	869			
84 86.5	868.5			
89	866.75 868.5			
149	869			
200	879			
Bank Station: Left	Right Lengt	hs: Left	Channel	Right
84	89	107	95	85
				0.5
CROSS SECTION OUTPUT	Profile #100 yr			
	_			
	<u>Element</u>	<u>Left OB</u>	<u>Channel</u>	<u>Right OB</u>
W.S. Elev (ft) 878.05				
E.G. Elev (ft) 878.06	Reach Len. (ft)	107.00	95.00	85.00
Crit W.S. (ft)	Flow Area (sq ft)	514.04	52.15	767.30
E.G. Slope 0.000005	Area (sq ft)	514.04	52.15	767.30
Q Total (cfs) 400.00	Flow (cfs)	139.00	34.60	226.40
Top Width (ft) 192.02	Top Width (ft)	80.85	5.00	106.18
Vel Total (fps) 0.30	Avg. Vel. (fps)	0.27	0.66	0.30
Max Chl Dpth(ft)11.30	Hydr. Depth (ft)	6.36	10.43	7.23
Length Wtd.(ft) 95.23	Wetted Per. (ft)	81.75	6.10	107.06
Min Ch El (ft) 866.75	Cum SA (acres)	1.65	0.11	1.37
	/	2.00	0.11	1.3/

CROSS SECTION RIVER	R: Sara Davis Ditch	REACH	: wetlands	RS: 13
Description:				
Station Elevation Data				
Station	Elevation			
0	879			
14	877			
53 95	869 867			
98	866.37			
101	867			
123	869			
168	875			
175	879			
Bank Station: Left	Right Lengt	hs: Left	Ob a see a 1	5 1.1.
95	101	30	Channel 42	Right 53
a *		30	12	33
CROSS SECTION OUTPUT	Profile #100 yr			
	<u>Element</u>	Left OB	Channel	Right OB
W.S. Elev (ft) 878.05				
E.G. Elev (ft) 878.06	Reach Len. (ft)	30.00	42.00	53.00
Crit W.S. (ft)	Flow Area (sq ft)	623.14	68.21	501.68
E.G. Slope 0.000005	Area (sq ft)	623.14	68.21	501.68
Q Total (cfs) 400.00	Flow (cfs)	191.29	57.15	151.56
Top Width (ft) 166.71	Top Width (ft)	88.37	6.00	72.34
Vel Total (fps) 0.34	Avg. Vel. (fps)	0.31	0.84	0.30
Max Chl Dpth(ft)11.68	Hydr. Depth (ft)	7.05	11.37	6.93
Length Wtd.(ft) 39.86	Wetted Per. (ft)	89.30	6.13	73.64
Min Ch El (ft) 866.37	Cum SA (acres)	1.45	0.10	1.20

CROSS SECTION RIVER	R: Sara Davis Ditch	REAC!	H: wetlands	RS: 12
Description:				
Station Elevation Data				
Station	Elevation			
0	879			
10	879			
20	877			
55	869			
93 95	867			
97.5	866.8 866.15			
100	866.8			
107	867			
119	869			
169	879			
Bank Station: Left	Right Lengt	ha. Tafe	Cl 1	5.1.1.
95	Right Lengt	hs: Left 118	Channel 113	Right 110
		110	113	110
CROSS SECTION OUTPUT	Profile #100 yr			
	<u>Element</u>	Left OB	<u>Channel</u>	Right OB
W.S. Elev (ft) 878.05				
E.G. Elev (ft) 878.06	Reach Len. (ft)	118.00	113.00	110.00
Crit W.S. (ft)	Flow Area (sq ft)	583.82	57.88	403.50
E.G. Slope 0.000007	Area (sq ft)	583.82	57.88	403.50
Q Total (cfs) 400.00	Flow (cfs)	211.41	56.40	132.18
Top Width (ft) 149.51	Top Width (ft)	80.26	5.00	64.26
Vel Total (fps) 0.38	Avg. Vel. (fps)	0.36	0.97	0.33
Max Chl Dpth(ft)11.90	Hydr. Depth (ft)	7.27	11.58	6.28
Length Wtd.(ft)114.26	Wetted Per. (ft)	81.33	5.17	65.32
Min Ch El (ft) 866.15	Cum SA (acres)	1.39	0.10	1.11
	·	•		

CROSS SECTION RIVER INPUT Description:	: Sara Davis Ditch	REACH	: wetlands	RS: 11.5
Station Elevation Data Station 0 40 81 84 87 106 127	Elevation 879 869 867 865.66 866.5 867			
Bank Station: Left 81	Right Lengt	hs: Left 95	Channel 98	Right 103
CROSS SECTION OUTPUT W.S. Elev (ft) 878.05	Profile #100 yr Element	<u>Left OB</u>	<u>Channel</u>	Right OB
E.G. Elev (ft) 878.05 Crit W.S. (ft)	Reach Len. (ft) Flow Area (sq ft)	95.00	98.00	103.00
E.G. Slope 0.000005 Q Total (cfs) 400.00 Top Width (ft) 147.65 Vel Total (fps) 0.34	Area (sq ft) Flow (cfs) Top Width (ft) Avg. Vel. (fps)	575.97 172.47 77.21	71.08 71.08 56.05 6.00 0.79	536.42 536.42 171.48 64.44 0.32
Max Chl Dpth(ft)12.39 Length Wtd.(ft) 99.14 Min Ch El (ft) 865.66	Hydr. Depth (ft) Wetted Per. (ft) Cum SA (acres)	7.46 78.37 1.17	11.85 6.40 0.08	8.32 66.16 0.95

CROSS SECTION RIVER	: Sara Davis Ditch	REACH	: wetlands	RS: 11
Description:			•	
Station Elevation Data				
Station	Elevation			
0	879			
43 63	871			
63 75	869 866			
78	865.24			
81	866			
118	869			
148	879			
Bank Station: Left	Right Lengt	hs: Left	Channel	Right
75	81	45	47	50
CROSS SECTION OUTPUT	Profile #100 yr			
	<u>Element</u>	Left_OB	<u>Channel</u>	Right OB
W.S. Elev (ft) 878.05				112-1110 02
E.G. Elev (ft) 878.05	Reach Len. (ft)	45.00	47.00	50.00
Crit W.S. (ft)	Flow Area (sq ft)	421.10	74.57	513.13
E.G. Slope 0.000007	Area (sq ft)	421.10	74.57	513.13
Q Total (cfs) 400.00	Flow (cfs)	131.94	74.96	193.10
Top Width (ft) 140.03	Top Width (ft)	69.89	6.00	64.15
Vel Total (fps) 0.40	Avg. Vel. (fps)	0.31	1.01	0.38
Max Chl Dpth(ft)12.81	Hydr. Depth (ft)	6.03	12.43	8.00
Length Wtd.(ft) 47.54	Wetted Per. (ft)	71.01	6.19	65.74
Min Ch El (ft) 865.24	Cum SA (acres)	1.01	0.07	0.80

CROSS SECTION RIVER INPUT Description:	R: Sara Davis Ditch	REAC	H: wetlands	RS: 10
Station Elevation Data Station 0 27 39 63 90 92.5 95	Elevation 879 875 873 871 865.8 865.04 865.8 869			
142 155 172	873 877 879			
Bank Station: Left 90	Right Lengt 95	hs: Left 85	Channel 66	Right 52
CROSS SECTION OUTPUT	Profile #100 yr			
W.S. Elev (ft) 878.05	<u>Element</u>	<u>Left OB</u>	<u>Channel</u>	Right OB
E.G. Elev (ft) 878.05	Reach Len. (ft)	85.00	66.00	52.00
Crit W.S. (ft)	Flow Area (sq ft)	485.53	63.14	423.11
E.G. Slope 0.000009	Area (sq ft)	485.53	63.14	423.11
Q Total (cfs) 400.00	Flow (cfs)	171.94	73.41	154.65
Top Width (ft) 157.47	Top Width (ft)	83.57	5.00	68.90
Vel Total (fps) 0.41	Avg. Vel. (fps)	0.35	1.16	0.37
Max Chl Dpth(ft)13.01	Hydr. Depth (ft)	5.81	12.63	6.14
Length Wtd.(ft) 69.23 Min Ch El (ft) 865.04	Wetted Per. (ft) Cum SA (acres)	84.54 0.93	5.23 0.06	70.25 0.72
	7	0.50	0.00	0.72

CROSS SECTION RIVER INPUT Description:	R: Sara Davis Ditch	REACI	H: wetlands	RS: 9
Station Elevation Data				
Station	Elevation			
0	879			
20	875			
38	873			
80	869			
120 123	866			
123	864.75 866			
154	867			
180	873			
189	873			
205	879			
Bank Station: Left 120 CROSS SECTION OUTPUT	Right Lengt 126 Profile #100 yr	hs: Left 34	Channel 46	Right 55
	=			
W.S. Elev (ft) 878.05	<u>Element</u>	<u>Left OB</u>	<u>Channel</u>	Right OB
E.G. Elev (ft) 878.05	Reach Len. (ft)	34.00	46.00	55.00
Crit W.S. (ft)	Flow Area (sq ft)	814.23	76.05	612.13
E.G. Slope 0.000003	Area (sq ft)	814.23	76.05	612.13
Q Total (cfs) 400.00	Flow (cfs)	193.08	50.69	156.23
Top Width (ft) 197.71	Top Width (ft)	115.25	6.00	76.47
Vel Total (fps) 0.27	Avg. Vel. (fps)	0.24	0.67	0.26
Max Chl Dpth(ft)13.30	Hydr. Depth (ft)	7.06	12.67	8.01
Length Wtd.(ft) 45.21	Wetted Per. (ft)	115.96	6.50	78.08
Min Ch El (ft) 864.75	Cum SA (acres)	0.74	0.06	
.==, ===	cam bir (acres)	0.74	0.06	0.63

CROSS SECTION INPUT	RIVER:	Sara Dav	ris Ditch		REACH:	wetlands	RS: 8
Description:							
Station Elevation	Data						
Station	Jaca	Elevation	1				
0		879					
10		877					
25		876.5					
34		877					
42 76		877					
116		869 865.5					
118.5		864.55					
121		865.5					
171		867					
200		877					
217		879					
Bank Station: Le:	£t	Right	Lengt	hs:	Left	Channel	Right
1:	16	121			62	43	21
CROSS SECTION OUTPO	UT	Profile #	100 yr				
		<u>Element</u>		<u>Left</u>	OB .	Channel	Right OB
W.S. Elev (ft) 878	.05						
E.G. Elev (ft) 878	.05	Reach Len	. (ft)	62.0	0	43.00	21.00
Crit W.S. (ft)		Flow Area	(sq ft)	646.0	0	65.12	770.09
E.G. Slope 0.000	003	Area (sq	ft)	646.0	0	65.12	770.09
Q Total (cfs) 400	.00	Flow (cfs	:)	138.3	5	46.03	215.62
Top Width (ft) 204		Top Width	(ft)	111.2	5	5.00	87.92
Vel Total (fps) 0		Avg. Vel.	(fps)	0.2	1 .	0.71	0.28
Max Chl Dpth(ft)13		Hydr. Dep	th (ft)	5.8	1	13.02	8.76
Length Wtd.(ft) 38		Wetted Pe	er. (ft)	112.4	5	5.35	89.68
Min Ch El (ft) 864	.55	Cum SA (a	cres)	0.6	5	0.05	0.53

CROSS SECTION RIVER INPUT Description:	ER: Sara Davis Ditch	n REAC	H: wetlands	RS: 7
Station Elevation Data Station 0 12 48 84 86.5 89 92 114 144	Elevation 879 877 867 865.5 864.37 865.5 865 865			
169 190 Bank Station: Left	877 879 Right Lengt	hs: Left	Channel	Right
84 CROSS SECTION OUTPUT	89 Profile #100 yr	42	40	37
W.S. Elev (ft) 878.05	<u>Element</u>	<u>Left OB</u>	<u>Channel</u>	Right OB
E.G. Elev (ft) 878.05 Crit W.S. (ft) E.G. Slope 0.000002	Reach Len. (ft) Flow Area (sq ft)		40.00 65.57	37.00 849.01
Q Total (cfs) 400.00	Area (sq ft) Flow (cfs)	645.88 148.91	65.57 39.20	849.01 211.89
Top Width (ft) 174.32 Vel Total (fps) 0.26 Max Chl Dpth(ft) 13.68	Top Width (ft) Avg. Vel. (fps)	78.30	0.60	91.02
Length Wtd.(ft) 39.35 Min Ch El (ft) 864.37	Hydr. Depth (ft) Wetted Per. (ft) Cum SA (acres)	8.25 79.78 0.52	13.11 5.49 0.04	9.33 93.12 0.49

CROSS SECTION RIVER	R: Sara Davis Ditch	REAC	H: wetlands	RS: 6
Description:				
Station Elevation Data				
Station	Elevation			
0	879			
42	869			
68	865			
92 94.5	865			
97	864.2 865			
147	867			
176	877			
199	879			
Bank Station: Left	Right Lengt	1		
92	Right Lengt	hs: Left 34	Channel 36	Right
		34	36	40
CBOSS SECULON OF BOTTOM				
CROSS SECTION OUTPUT	Profile #100 yr			
	<u>Element</u>	<u>Left OB</u>	<u>Channel</u>	Right OB
W.S. Elev (ft) 878.05				
E.G. Elev (ft) 878.05	Reach Len. (ft)	34.00	36.00	40.00
Crit W.S. (ft)	Flow Area (sq ft)	772.46	67.25	784.25
E.G. Slope 0.000002	Area (sq ft)	772.46	67.25	784.25
Q Total (cfs) 400.00	Flow (cfs)	179.67	40.67	179.66
Top Width (ft) 184.08	Top Width (ft)	88.01	5.00	91.07
Vel Total (fps) 0.25	Avg. Vel. (fps)	0.23	0.60	0.23
Max Chl Dpth(ft)13.85	Hydr. Depth (ft)	8.78	13.45	8.61
Length Wtd.(ft) 36.77	Wetted Per. (ft)	89.38	5.25	92.83
Min Ch El (ft) 864.20	Cum SA (acres)	0.44	0.04	0.41

CROSS SECTION RIVER INPUT Description:	R: Sara Davis Ditch	n REAC	H: wetlands	RS: 5
Station Elevation Data				
Station	Elevation			
0	879			
13	877			
40	867			
98	865			
100.5	864.04			
103 149	865			
184	867 877			
207	879			
	0,75			
Bank Station: Left	Right Lengt	hs: Left	Channel	Right
98	103	40	42	44
CROSS SECTION OUTPUT	Profile #100 yr			
W. C. 73 (0.)	<u>Element</u>	<u>Left OB</u>	<u>Channel</u>	<u>Right OB</u>
W.S. Elev (ft) 878.05				
E.G. Elev (ft) 878.05	Reach Len. (ft)	40.00	42.00	44.00
Crit W.S. (ft)	Flow Area (sq ft)	865.80	67.65	772.36
E.G. Slope 0.000002	Area (sq ft)	865.80	67.65	772.36
Q Total (cfs) 400.00	Flow (cfs)	198.58	38.23	163.20
Top Width (ft) 189.89	Top Width (ft)	91.82	5.00	93.07
Vel Total (fps) 0.23	Avg. Vel. (fps)	0.23	0.57	0.21
Max Chl Dpth(ft)14.01	Hydr. Depth (ft)	9.43	13.53	8.30
Length Wtd.(ft) 41.99	Wetted Per. (ft)	93.73	5.36	94.56
Min Ch El (ft) 864.04	Cum SA (acres)	0.37	0.04	
	(40200)	0.57	0.04	0.33

Q Total (cfs) 400.00

Top Width (ft) 194.93

Vel Total (fps) 0.23

Max Chl Dpth(ft)14.19

Length Wtd.(ft)244.00

Min Ch El (ft) 863.86

CROSS SECTION RIVER: Sara Davis Ditch REACH: wetlands RS: 3 INPUT Description: Culvert, upstream Station Elevation Data Station Elevation 0 879 32 869 87 867 94 864.8 96.5 863.86 99 864.8 148 867 164 869 188 877 207 879 Bank Station: Left Right Lengths: Left Channel Right 94 99 294 244 249 CROSS SECTION OUTPUT Profile #100 yr Element Left OB <u>Channel</u> Right OB W.S. Elev (ft) 878.05 E.G. Elev (ft) 878.05 Reach Len. (ft) 294.00 244.00 249.00 Crit W.S. (ft) 867.41 Flow Area (sq ft) 768.81 68.60 882.55 E.G. Slope 0.000002 Area (sq ft) 768.81 68.60 882.55

Flow (cfs)

Top Width (ft)

Avg. Vel. (fps)

Hydr. Depth (ft)

Wetted Per. (ft)

Cum SA (acres)

164.50

90.96

0.21

8.45

92.71

0.34

39.29

5.00

0.57

13.72

5.34

0.04

196.20

98.97

0.22

8.92

0.29

100.50

CROSS SECTION RIVER: Sara Davis Ditch REACH: wetlands RS: 2

INPUT

Description: existing CMP under C.R. 250

Distance from Upstream XS = 44
Deck/Roadway Width = 100
Weir Coefficient = 2.6
Bridge Deck/Roadway Skew =

Upstream De	ck/Roadway Coordi	nates	Upstream Bridge	Cross Section Data
Statio		Lo Cord	Station	Elevation
0	879	879	0	879
32	879	869	32	869
87	879	867	87	867
94	879	864.8	94	864.8
96.	5 879	863.86	96.5	863.86
99	879	864.8	99	864.8
148	87 9	867	148	867
164	879	869	164	869
188	879	877	188	877
207	879	879	207	879

Bank Station: Left Right 94 99

Downstream	Deck/Roadway Co	oordinates	Downstream Bridge	Cross Section Data
Statio		Lo Cord	Station	Elevation
0	880	880	0	880
42	879	875	25	875
69	879	870	65	870
117	879	865	110	863.65
124	879	865	114.5	862.3
144	879	870	119	863.65
182	879	875	125	870
244	880	880	200	875

Bank Station: Left Right 110 119

Number of Outlets = 2

Outlet Name Culvert #1	<u>Shape</u> Circu		nsion(s) ia. Corrugate	d metal pipe
Details:	Distance fr Length n Value Entrance Lo Exit Loss C Number of B	ss Coef oef arrels	44 ft 100 ft 0.025 0.6 1.0	
	Upstream Downstream	Centerline Elevation		863.77 98 862.87
		Centerline	Stations	117

CROSS SECTION RIVER: Sara Davis Ditch REACH: wetlands RS: 1

INPUT

Description: Downstream End

Station Elevation Data

Station	Elevation
0	880
25	875
65	870
110	863.65
114.5	862.3
119	863.65
125	870
200	875

Bank Station: Left Right 110 119

CROSS SECTION OUTPUT	Profile #100 yr			
	<u>Element</u>	Left OB	<u>Channel</u>	Right OB
W.S. Elev (ft) 866.53*				
E.G. Elev (ft) 870.19	Reach Len. (ft)	not applic	able, end of	run
Crit W.S. (ft) 866.53	Flow Area (sq ft)	7.34	19.03	0.98
E.G. Slope 0.025551	Area (sq ft)	7.34	19.03	0.98
Q Total (cfs) 400.00	Flow (cfs)	34.75	361.62	3.63
Top Width (ft) 20.56	Top Width (ft)	10.20	9.00	1.36
Vel Total (fps) 14.63	Avg. Vel. (fps)	4.74	19.01	3.71
Max Chl Dpth(ft) 2.79	Hydr. Depth (ft)	0.72	2.11	0.72
Length Wtd.(ft) 0.00	Wetted Per. (ft)	10.30	9.40	1.98
Min Ch El (ft) 862.30	Cum SA (acres)			

 $[\]star$ Note: During supercritical analysis, the culvert direct step method went to critical depth. The program then assumed critical depth at the outlet.

HEC-RAS Version 2.1 October 1997 U.S. Army Corp of Engineers Hydrologic Engineering Center 609 Second Street, Suite D Davis, California 95616-4687 (916) 756-1104

х	x	XXXXXX	XX	XX		XX	XX	X	x	XXXX	
Х	X	x	Х	х		Х	Х	Х	х	X	
X	Х	X	Х			Х	Х	Х	х	Х	
XXXX	XXX	XXXX	Х		XXX	XX	XX	XXX	XXX	XXXX	
X	X	X	Х			Х	X	Х	х	Х	
х	Х	X	X	Х		Х	Х	х	х	Х	:
Х	X	XXXXXX	XX	XX		Х	Х	Х	х	XXXXX	

PROJECT DATA

Project Title: Sara Davis Ditch, Proposed

Project File : davis_pr.prj

Run Date and Time: 3/31/98 3:20:54 PM

Project in English units

Project Description:

Sara Davis Ditch is an existing stormwater conveyance for Shipshewana Lake in Indiana. The proposed project will construct a wetland along approximately 615 feet of the ditch adjacent to C.R. 250. This model will be performed in two stages, existing condition and proposed condition. The intent is to prove that there is little or no impact to the 100 year flood plain.

PLAN DATA

Plan Title: Plan 01

Plan File : C:\HEC-ras\DATA\davis_pr.p01

Geometry Title: Sara Davis proposed

Geometry File : C:\HEC-ras\DATA\davis_pr.g01

Flow Title : Sara Davis

Flow File : C:\HEC-ras\DATA\davis pr.f01

Plan Summary Information:

Number of: Cross Sections = 15 Multiple Openings = (

Culverts = 1 Inline Weirs = 0

Bridges = 0

Computational Information

Water surface calculation tolerance = 0.01 Critical depth calculation tolerance = 0.01 Maximum number of iterations = 20 Maximum difference tolerance = 0.3 Flow tolerance factor = 0.001

Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Sara Davis

Flow File : C:\HEC-ras\DATA\davis_pr.f01

Flow Data (cfs)

River Reach RS 100 yr Sara Davis Ditch wetlands 15 400 cfs

Boundary Conditions

River River Reach Profile
Sara Davis Ditch wetlands 100 yr <u>Upstream</u> Downstream Critical Critical

GEOMETRY DATA

Geometry Title: Sara Davis proposed Geometry File : C:\HEC-ras\DATA\davis_pr.g01

GENERAL INPUT VALUES

Manning's n Values

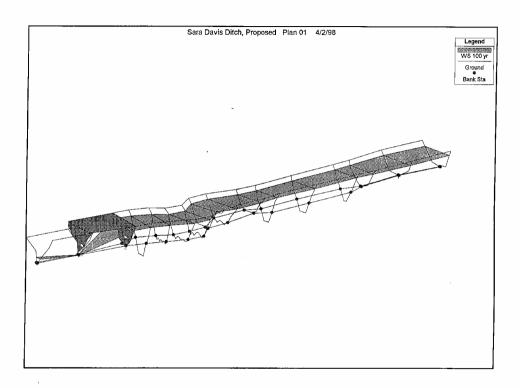
Left Bank 0.04 Channel 0.02 Right Bank 0.04

Coefficient of: Contraction = 0.1 Expansion = 0.3

HEC-RAS Model ver 2.1 Sara Davis Ditch, proposed March 31, 1998

Profile Output Table

Reach	River Sta	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
wetlands	15	876.29	876.29	0.00	134.51	43.75	221.74	159.70
wetlands	14	876.29	876.29	0.00	130.71	38.10	231.19	177.13
wetlands	13	876.29	876.28	0.00	195.39	62.92	141.69	152.76
wetlands	12	876.29	876.29	0.00	19.77	358.80	21.42	136.99
wetlands	11.5	876.29	876.29	0.00	14.19	370.28	15.54	139.36
wetlands	11	876.29	876.29	0.00	12.04	369.96	18.00	128.33
wetlands	10	876.29	876.28	0.01	41.04	313.34	45.62	145.66
wetlands	9	876.29	876.28	0.00	27.91	349.09	23.00	178.56
wetlands	8	876.29	876.28	0.00	61.38	142.75	195.87	155.21
wetlands	7	876.29	876.28	0.00	22.60	356.36	21.05	155.99
wetlands	6	876.29	876.28	0.00	20.21	360.57	19.21	162.92
wetlands	5	876.29	876.28	0.00	17.92	357.68	24.41	166.80
wetlands	4	⁻ 876.29	876.28	0.00	12.45	373.94	13.61	176.93
wetlands	3	876.29	876.28	0.00	90.84	232.65	76.51	181.73
wetlands	2	Culve	rt					
wetlands	1	867.70	866.53	1,17	80.05	311.59	8.36	32.12



INPUT	R: Sara Davis Ditch	REACH	: wetlands	RS: 15
Description: Upstream s	start			
Station Elevation Data				
Station	Elevation			
0	879			
32	869			
54	869			
66	868			
68.5	867.2			
71	868			
121	869			
186	879			
Bank Station: Left	Right Lengt	hs: Left	Channel	D4 - 1-1
66	71	105	105	Right 105
		103	105	105
CROSS SECTION OUTPUT	Profile #100 yr			
	<u>Element</u>	Left OB	Channel	Right OB
W.S. Elev (ft) 876.29	·		<u>Gridinic r</u>	KIGHE OB
E.G. Elev (ft) 876.29	Reach Len. (ft)	105.00	105.00	105.00
Crit W.S. (ft) 869.76	Flow Area (sq ft)	338.81	43.44	562.08
E.G. Slope 0.000011	Area (sq ft)	338.81	43.44	562.08
Q Total (cfs) 400.00	Flow (cfs)	134.51	43.75	221.74
Top Width (ft) 159.70	Top Width (ft)	57.32	5.00	97.38
Vel Total (fps) 0.42	Avg. Vel. (fps)	0.40	1.01	0.39
Max Chl Dpth(ft) 9.09	Hydr. Depth (ft)	5.91	8.69	5.77
Length Wtd.(ft)105.00	Wetted Per. (ft)	58.48	5.25	97.94
Min Ch El (ft) 867.20	Cum SA (acres)	1.22		
,	Jam Dri (ucies)	1.22	1.09	1.15

CROSS SECTION RIVER INPUT Description:	R: Sara Davis Ditch	n REAC	H: wetlands	RS: 14
Station Elevation Data				
Station	Elevation			
0 20	879			
47	873 871			
76	869			
84	868.5			
86.5	866.75			
89 149	868.5			
200	869 879			
	075			
Bank Station: Left 84	Right Lengt	hs: Left 107	Channel 95	Right 85
CROSS SECTION OUTPUT	Profile #100 yr			
	<u>Element</u>	Left OB	Channel	Right OB
W.S. Elev (ft) 876.29				MAGNE OD
E.G. Elev (ft) 876.29	Reach Len. (ft)	107.00	95.00	85.00
Crit W.S. (ft)	Flow Area (sq ft)	376.45	43.31	587.72
E.G. Slope 0.000010	Area (sq ft)	376.45	43.31	587.72
Q Total (cfs) 400.00	Flow (cfs)	130.71	38.10	231.19
Top Width (ft) 177.13	Top Width (ft)	74.96	5.00	97.17
Vel Total (fps) 0.40	Avg. Vel. (fps)	0.35	0.88	0.39
Max Chl Dpth(ft) 9.54	Hydr. Depth (ft)	5.02	8.66	6.05
Length Wtd.(ft) 95.23	Wetted Per. (ft)	75.60	6.10	97.88
Min Ch El (ft) 866.75	Cum SA (acres)	1.06	1.08	0.91

CROSS SECTION RIVER INPUT Description:	R: Sara Davis Ditch	n REAC	H: wetlands	RS: 13
Station Elevation Data Station 0 14 53 95 98 101 123 168 175	Elevation 879 877 869 867 866.37 867 869 875			
Bank Station: Left 95	Right Lengt	ths: Left	Channel 42	Right 53
CROSS SECTION OUTPUT W.S. Elev (ft) 876.28	Profile #100 yr Element	Left OB	<u>Channel</u>	Right OB
E.G. Elev (ft) 876.29 Crit W.S. (ft) E.G. Slope 0.000011 Q Total (cfs) 400.00 Top Width (ft) 152.76 Vel Total (fps) 0.44 Max Chl Dpth(ft) 9.91 Length Wtd.(ft) 41.02 Min Ch El (ft) 866.37	Reach Len. (ft) Flow Area (sq ft) Flow (cfs) Top Width (ft) Avg. Vel. (fps) Hydr. Depth (ft) Wetted Per. (ft) Cum SA (acres)	30.00 477.33 477.33 195.39 77.51 0.41 6.16 78.30 0.87	42.00 57.60 57.60 62.92 6.00 1.09 9.60 6.13 1.07	53.00 376.54 376.54 141.69 69.25 0.38 5.44 70.08 0.75

INPUT	R: Sara Davis Ditch	REAC	H: wetlands	RS: 12
Description: Forebay				
Station Elevation Data				
Station	Elevation			
0	879			
10	879			
20	877			
44	871			
50	869			
60 88	867	×		
102	861			
123	861 867			
132	869			
142	871			
169	879			
Bank Station: Left 60	Right Lengt 123	hs: Left 118	Channel 113	Right 110
CROSS SECTION OUTPUT	Profile #100 yr			
W.S. Elev (ft) 876.29	Element	<u>Left OB</u>	<u>Channel</u>	Right OB
E.G. Elev (ft) 876.29	Reach Len. (ft)	118.00	113.00	110.00
Crit W.S. (ft)	Flow Area (sq ft)	176.48	816.05	184.60
E.G. Slope 0.000001	Area (sq ft)	176.48	816.05	184.60
Q Total (cfs) 400.00	Flow (cfs)	19.77	358.80	21.42
Top Width (ft) 136.99	Top Width (ft)	37.15	63.00	36.84
Vel Total (fps) 0.34	Avg. Vel. (fps)	0.11	0.44	0.12
Max Chl Dpth(ft)15.29	Hydr. Depth (ft)	4.75	12.95	5.01
Length Wtd.(ft)113.07	Wetted Per. (ft)	38.32	64.48	38.03
Min Ch El (ft) 861.00	Cum SA (acres)	0.83	1.04	0.68

CROSS SECTION RIVER INPUT Description: Forebay makes	R: Sara Davis Ditcl	n REACI	i: wetlands	RS: 11.5
roleday mi	rarrie			
Station Elevation Data				
Station	Elevation			
0	879			
34	871			
40 48	869 867			
66	861			
102	861			
121	867			
129	869			
139	871			
157	879			
Bank Station: Left	Right Lengt	hs: Left	Channal	51.1.
48	121	.ns: Lerc 95	Channel 98	Right 103
			30	103
Chaca charter				
CROSS SECTION OUTPUT	Profile #100 yr			
	<u>Element</u>	Left_OB	<u>Channel</u>	Right OB
W.S. Elev (ft) 876.29				
E.G. Elev (ft) 876.29	Reach Len. (ft)	95.00	98.00	103.00
Crit W.S. (ft)	Flow Area (sq ft)	163 41	1004.94	160.61
E.G. Slope 0.000001	Area (sq ft)	163.41	1004.94	160.61
Q Total (cfs) 400.00	Flow (cfs)			
		14.19	370.28	15.54
Top Width (ft) 139.36	Top Width (ft)	36.47	73.00	29.90
Vel Total (fps) 0.30	Avg. Vel. (fps)	0.09	0.37	0.10
Max Chl Dpth(ft)15.29	Hydr. Depth (ft)	4.48	13.77	5.37
Length Wtd.(ft) 98.11	Wetted Per. (ft)	37.65	74.90	31.46
Min Ch El (ft) 861.00	Cum SA (acres)	0.73	0.86	0.60
		· -	0.00	0.00

CROSS SECTION RIV	ER: Sara Davis Ditc	h REAC	H: wetlands	RS: 11
Description: Forebay				
Station Elevation Dat	a			
Station	Elevation			
0	879			
30	873			
34	871			
46 65	867			
93	861 861			
112	867			
130	871			
148	879			
Bank Station: Left	Right Leng	ths: Left	Channel	Right
46	112	45	47	50
CROSS SECTION OUTPUT	Profile #100 yr			
	Element	<u>Left</u> OB	Channel	Diaht: OD
W.S. Elev (ft) 876.29		<u> Here ob</u>	Chamier	<u>Right OB</u>
E.G. Elev (ft) 876.29	Reach Len. (ft)	45.00	47.00	50.00
Crit W.S. (ft)	Flow Area (sq ft)) 131.58	894.89	162.59
E.G. Slope 0.000001	Area (sq ft)	131.58	894.89	162.59
Q Total (cfs) 400.00	Flow (cfs)	12.04	369.96	18.00
Top Width (ft) 128.33	Top Width (ft)	32.43	66.00	29.89
Vel Total (fps) 0.34	Avg. Vel. (fps)	0.09	0.41	0.11
Max Chl Dpth(ft)15.29	Hydr. Depth (ft)	4.06	13.56	5.44
Length Wtd.(ft) 47.11	Wetted Per. (ft)	33.88	67.85	31.45
Min Ch El (ft) 861.00	Cum SA (acres)	0.66	0.70	0.53

INF	SS SECTION PUT	1 R	IVER:	Sara	Davis	Ditch		REACH	: wetlands	RS: 10
Des	scription:	foreba	y spi	llway						
Sta	tion Eleva	ation Da	ata							
	Station	ı		Elevat	tion					
	0			879						
	9			877						
	27			875						
	38 45			873						
	63			8 7 1 869						
	121			869						
	140			871						
	164			877						
	171			879						
Ban	k Station:	Left 63	-	Right 121		Lengt	ns:	Left 85	Channel 66	Right 52
CRO	SS SECTION	OUTPU	<u>r</u>	Profil	Le #100) yr				
]	Elemer	<u>ıt</u>		Left	ОВ	Channel	Right OB
W.S	. Elev (ft	3) 876.2	28							straine ob
E.G	. Elev (ft	3) 876.2	29 1	Reach	Len.	(ft)	85.0	0	66.00	52.00
Cri	t W.S. (ft	:)	1	Flow A	Area (s	g ft)	175.5	1	422.31	175.13
E.G	. Slope	0.0000	07 2	Area	(sq ft)		175.5	1	422.31	175.13
QT	otal (cfs)	400.0	00 1	Flow	(cfs)		41.0	4	313.34	45.62
Top	Width (ft) 145.6	56 .	rop Wi	dth (f	t)	47.5	3	58.00	40.13
Vel	Total (fp	s) 0.5	52 <i>i</i>	Avg. V	7el. (f	ps)	0.2	3	0.74	0.26
Max	Chl Dpth(ft) 7.2	28 I	Hydr.	Depth	(ft)	3.6	9	7.28	4.36
Len	gth Wtd.(f	t) 66.4	14 T	Vette	l Per.	(ft)	48.1	7	58.00	40.88
Min	Ch El (ft) 869.0	00 (Cum SA	A (acre	es)	0.6	2	0.64	0.49

CROSS SECTION RIV	ER: Sara Davis Ditc	h REAC	H: wetlands	RS: 9
Description: Wetlands				
Station Elevation Data	a			
Station	Elevation			
0	879			
20	875			
49	871			
68	867			
82 89.5	866			
97	865.2 866			
114	867			
126	866			
132	865.25			
138	866			
152	867			
187 203	875			
203	879			
Bank Station: Left 68	Right Leng 152	ths: Left 34	Channel 46	Right 55
CROSS SECTION OUTPUT	Profile #100 yr			
	<u>Element</u>	Left OB	<u>C</u> hannel	Right OB
W.S. Elev (ft) 876.28				
E.G. Elev (ft) 876.29	Reach Len. (ft)	34.00	46.00	55.00
Crit W.S. (ft)	Flow Area (sq ft)	237.77	845.88	188.25
E.G. Slope 0.000001	Area (sq ft)	237.77	845.88	188.25
Q Total (cfs) 400.00	Flow (cfs)	27.91	349.09	23.00
Top Width (ft) 178.56	Top Width (ft)	54.42	84.00	40.14
Vel Total (fps) 0.31	Avg. Vel. (fps)	0.12	0.41	0.12
Max Chl Dpth(ft)11.08	Hydr. Depth (ft)	4.37	10.07	4.69
Length Wtd.(ft) 47.12	Wetted Per. (ft)	55.24	84.32	41.20
Min Ch El (ft) 865.20	Cum SA (acres)	0.52	0.53	0.44

CROSS SECTION RIV	ER: Sara Davis Ditc	h REAC	H: wetlands	RS: 8
Description: wetlands				
Station Elevation Dat	_			
Station Station				
0	Elevation			
10	879 877			
25	876.5			
34	877			
42	877			
77	869			
85	867			
94	866			
100	865			
103	864.89			
106	865			
112	866			
117 150	866.5			
166	866.5 867			
203	877			
217	879			
	0,15			
Bank Station: Left	Right Leng	ths: Left	Channel	Right
94	112	62	43	21
CROSS SECTION OUTPUT	Profile #100 yr			
	-	T C		
W.G. 73 (G.)	<u>Element</u>	<u>Left OB</u>	<u>Channel</u>	<u>Right OB</u>
W.S. Elev (ft) 876.28				
E.G. Elev (ft) 876.29		62.00	43.00	21.00
Crit W.S. (ft)	Flow Area (sq ft	270.33	197.42	684.93
E.G. Slope 0.000004	Area (sq ft)	270.33	197.42	684.93
Q Total (cfs) 400.00	Flow (cfs)	61.38	142.75	195.87
Top Width (ft) 155.21	Top Width (ft)	48.86	18.00	88.35
Vel Total (fps) 0.35	Avg. Vel. (fps)	0.23	0.72	0.29
Max Chl Dpth(ft)11.39	Hydr. Depth (ft)	5.53	10.97	7.75
Length Wtd.(ft) 39.03	Wetted Per. (ft)	49.99	18.17	89.61
Min Ch El (ft) 864.89		0.48	0.47	
	311 (dc1cs)	0.40	0.4/	0.36

CROSS SECTION RIVER INPUT Description: wetlands	d: Sara Davis Ditch	n REACH	I: wetlands	RS: 7
Station Elevation Data				
Station	Elevation	Stati	on	Elevation
0	879	115		865
12	877	122	2	866
48	867	124	Į.	866
52	866	131		865
60 63	865	133		864.41
66	864.67 865	135		865
75	866	141 145		866 867
85	867	150		869
92	867	160		871
103	866	172	2	877
110	865	190)	879
112.5	864.5			
Bank Station: Left 52	Right Lengt 141	ths: Left 42	Channel 40	Right 37
CROSS SECTION OUTPUT	Profile #100 yr			
	Element	<u>Left OB</u>	<u>Channel</u>	Right OB
W.S. Elev (ft) 876.28				
E.G. Elev (ft) 876.29	Reach Len. (ft)	42.00	40.00	37.00
Crit W.S. (ft)	Flow Area (sq ft)	194.28	938.18	171.31
E.G. Slope 0.000001	Area (sq ft)	194.28	938.18	171.31
Q Total (cfs) 400.00	Flow (cfs)	22.60	356.36	21.05
Top Width (ft) 155.99	Top Width (ft)	37.42	89.00	29.57
Vel Total (fps) 0.31	Avg. Vel. (fps)	0.12	0.38	0.12
Max Chl Dpth(ft)11.87	Hydr. Depth (ft)	5.19	10.54	5.79
Length Wtd.(ft) 39.96	Wetted Per. (ft)	38.81	89.81	31.52
Min Ch El (ft) 864.41	Cum SA (acres)	0.42	0.42	0.33

INPUT	IVER: Sara Davis Dito	ch REACH: wetlands	RS: 6
Description: wetlan	·α		
Station Elevation D	ata		
Station	Elevation	Station	Elevation
0	8 7 9	115	866
42	869	124	865
52 58	866	128	864.25
67.5	865 864.45	132	865
77	865	143	866
85	865.3	147 152	867
93	865	162	869 871
96	864.35	176	877
99	865	199	879
113	866		
Bank Station: Lef	t Right Leng	ths: Left Channel	Right
52	143	34 36	40
CROSS SECTION OUTPU	T Profile #100 yr		
	Element	T . C	
W.C. Flance (St.) one		<u>Left OB</u> <u>Channel</u>	<u>Right OB</u>
W.S. Elev (ft) 876.			
E.G. Elev (ft) 876.	29 Reach Len. (ft)	34.00 36.00	40.00
Crit W.S. (ft)	Flow Area (sq ft	199.26 1012.62	175.97
E.G. Slope 0.0000	01 Area (sq ft)	199.26 1012.62	175.97
Q Total (cfs) 400.	00 Flow (cfs)	20.21 360.57	19.21
Top Width (ft) 162.	92 Top Width (ft)	40.59 91.00	31.33
Vel Total (fps) 0.2	29 Avg. Vel. (fps)	0.10 0.36	0.11
Max Chl Dpth(ft)12.	03 Hydr. Depth (ft)		5.62
Length Wtd.(ft) 36.			
Min Ch El (ft) 864.2	· - •	51.51	33.12
, 001.2	- cum on (acres)	0.38 0.34	0.31

CROSS SECTION RIVE	R: Sara Davis Ditch	REACH: wetlands	RS: 5
Description: wetland			
Station Elevation Data			
Station	Elevation	Station	Elevation
0	879	104	864.06
13	877	113	865
40	867	120	865.5
46	866	127	865
51	865	130.5	864.11
56	864.24	134	865
61 71	865	141	866
7± 78	865.5	149	867
81.5	865 864.24	154	869
85	865	165	871
93	865.5	184 207	877 879
101	865	207	879
Bank Station: Left 46	Right Lengths:	: Left Channel 40 42	Right 44
CROSS SECTION OUTPUT	Profile #100 yr		
W.S. Elev (ft) 876.28	Element Le	eft OB <u>Channel</u>	Right OB
E.G. Elev (ft) 876.29	Decel 7 (C)		
		10.00 42.00	44.00
Crit W.S. (ft)	Flow Area (sq ft) 17	75.07 1069.46	233.03
E.G. Slope 0.000001	Area (sq ft) 17	75.07 1069.46	233.03
Q Total (cfs) 400.00	Flow (cfs) 1	7.92 357.68	24.41
Top Width (ft) 166.80	Top Width (ft) 3	95.00	40.73
Vel Total (fps) 0.27	Avg. Vel. (fps)	0.10 0.33	0.10
Max Chl Dpth(ft)12.22	Hydr. Depth (ft)	5.64 11.26	5.72
Length Wtd.(ft) 42.02	Wetted Per. (ft) 3	32.81 95.96	42.18
Min Ch El (ft) 864.06	Cum SA (acres)	0.35 0.26	0.27

CROSS SECTION RI	IVER: Sara Davis Ditc	h REAC	H: wetlands	RS: 4
Description: Micropo	ool			
Station Elevation Da	a+a			
Station	Elevation			
0	879			
32	869			
41	867			
46	866			
55	864			
71	858			
114 135	858			
143	864 866			
154	869			
168	871			
188	877			
206	879			
Bank Station: Left	Right Lengt	ths: Left	Channel 38	Right 38
CROSS SECTION OUTPUT	Profile #100 yr			
	Element	<u>Left OB</u>	Channel	Diaht OD
W.S. Elev (ft) 876.2		DOLC OD	Chamier	<u>Right OB</u>
E.G. Elev (ft) 876.2	9 Reach Len. (ft)	38.00	38.00	38.00
Crit W.S. (ft)	Flow Area (sq ft)	208.39	1543.61	231.16
E.G. Slope 0.00000	00 Area (sq ft)	208.39	1543.61	231.16
Q Total (cfs) 400.0	00 Flow (cfs)	12.45	373.94	13.61
Top Width (ft) 176.9	3 Top Width (ft)	37.31	97.00	42.62
Vel Total (fps) 0.2	O Avg. Vel. (fps)	0.06	0.24	0.06
Max Chl Dpth(ft)18.2	8 Hydr. Depth (ft)	5.59	15.91	5.42
Length Wtd.(ft) 38.0	0 Wetted Per. (ft)	38.74	99.39	43.93
Min Ch El (ft) 858.0		0.32	0.17	0.23

INPUT	R: Sara Davis Ditc	h REAC	H: wetlands	RS: 3
Description: Section a	t outlet structure			
Station Elevation Data				
Station	Elevation			
0	879			
48	869			
62	867			
85	865			
123	865			
129 146	866			
158	867			
178	871 873			
189	873 875			
207	879			
	0,75			
Bank Station: Left	Right Lengt	hs: Left	Channel	Right
85	123	256	206	211
CROSS SECTION OUTPUT	Profile #100 yr			
THE CANOLINA COLLOR				
	<u>Element</u>	<u>Left OB</u>	<u>Channel</u>	<u>Right OB</u>
W.S. Elev (ft) 876.28				
E.G. Elev (ft) 876.29	Reach Len. (ft)	256.00	206.00	211.00
Crit W.S. (ft) 866.44	Flow Area (sq ft)	479.73	428.73	432.83
E.G. Slope 0.000002	Area (sq ft)	479.73	428.73	432.83
Q Total (cfs) 400.00	Flow (cfs)	90.84	232.65	76.51
Top Width (ft) 181.73	Top Width (ft)	71.96	38.00	71.77
Vel Total (fps) 0.30	Avg. Vel. (fps)	0.19	0.54	0.18
Max Chl Dpth(ft)11.28	Hydr. Depth (ft)	6.67	11.28	6.03
Length Wtd.(ft)206.00	Wetted Per. (ft)	72.93	38.00	72.95
Min Ch El (ft) 865.00	Cum SA (acres)	0.27		
	or (acres)	0.27	0.11	0.18

HEC-RAS Model ver 2.1 Sara Davis Ditch, proposed March 31, 1998

CROSS SECTION

RIVER: Sara Davis Ditch

REACH: wetlands RS: 2

INPUT

Description: Outlet structure connected to existing CMP

Distance from Upstream XS = 0 Deck/Roadway Width = 106 Weir Coefficient = 2.6

Bridge Deck/Roadway Skew =

		adway Coordin	nates	Upstream Bridge	Cross Section Data
Sta	ation	Hi Cord	Lo Cord	Station	Elevation
	0	879	879	0	879
	48	879	869	48	869
	62	879	867	62	867
	85	879	865	85	865
	123	879	865	123	865
	129	879	866	129	866
	146	879	867	146	867
	158	879	871	158	871
	178	879	873	178	873
	189	879	875	189	875
2	207	879	879	207	879

Bank Station: Left Right 85 123

Downstream	Deck/Roadway Coo	rdinates	Downstream Bridge	Cross Section Data
Statio	on Hi Cord	Lo Cord	Station	Elevation
0	880	880	0	880
42	879	875	25	875
69	879	870	65	870
117	879	865	110	863.65
124	879	865	114.5	862.3
144	879	870	119	863.65
182	879	875	125	870
244	880	880	200	875

Bank Station: Left

Left Right 110 119

HEC-RAS Model ver 2.1 Sara Davis Ditch, proposed March 31, 1998

Number of Outlets = 2

Outlet Name	<u>Shape</u>	Dimension(s)

Culvert #1 Circular 6" dia. PVC, reverse slope pipe

Details: Length approx 5 ft n Value 0.009

Entrance Loss Coef 0.6
Exit Loss Coef 1.0
Number of Barrels 2

Upstream Elevation 863

Centerline Stations 85, 95

Downstream Elevation 864

Centerline Stations 85, 95

 Outlet Name
 Shape
 Dimension(s)

 Culvert #2
 Box
 1.5'r X 22.5's

(Orifice is in 3 parts, 2 at 4.5' and 1 at

13.5', all with same rise.)

Details: Length 4 inches (depth of Conc.)

n Value 0.015 Entrance Loss Coef 0.6 Exit Loss Coef 1.0

Upstream Elevation 869 Centerline Stations 89

Downstream Elevation 869

Centerline Stations 89

HEC-RAS Model ver 2.1 Sara Davis Ditch, proposed March 31, 1998

CROSS SECTIO	N RIVER:	Sara Davis	Ditch	REACH:	wetlands	RS:	1
TMDDD							_

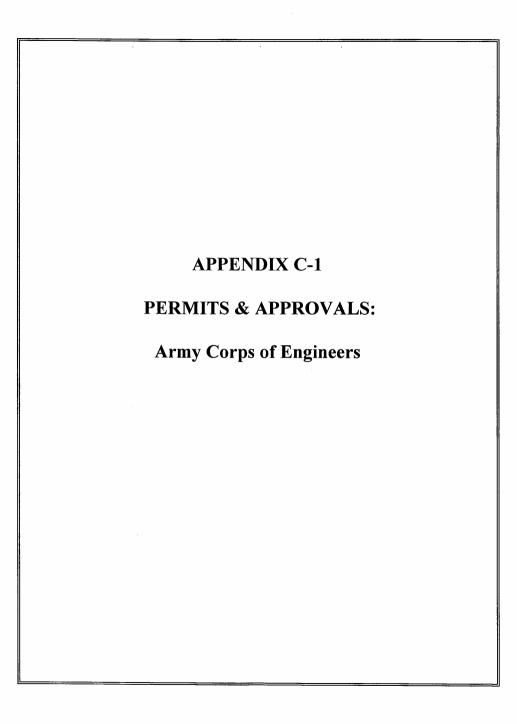
Description: Downstream End

Station Elevation Data

Station	Elevation
0	880
25	875
65	870
110	863.65
114.5	862.3
119	863.65
125	870
200	875

Bank Station: Left Right 110 119

CROSS SECTION OUTPUT	Profile #100 yr			
	<u>Element</u>	<u>Left OB</u>	<u>Channel</u>	Right OB
W.S. Elev (ft) 866.53				
E.G. Elev (ft) 867.70	Reach Len. (ft)	not applic	able, end of	run
Crit W.S. (ft) 866.53	Flow Area (sq ft)	29.36	31.98	3.91
E.G. Slope 0.003358	Area (sq ft)	29.36	31.98	3.91
Q Total (cfs) 400.00	Flow (cfs)	80.05	311.59	8.36
Top Width (ft) 32.12	Top Width (ft)	20.40	9.00	2.72
Vel Total (fps) 6.13	Avg. Vel. (fps)	2.73	9.74	2.14
Max Chl Dpth(ft) 4.23	Hydr. Depth (ft)	1.44	3.55	1.44
Length Wtd.(ft)	Wetted Per. (ft)	20.60	9.40	3.96
Min Ch El (ft) 862.30	Cum SA (acres)			





Public Notice



US Army Corps of Engineers **Detroit District**

Applicant: Shipshewana Community Lake Improvement

Date: December 17, 1997 Expires: January 5, 1998

In Reply Refer To: File No. 97-144-034-0A

THIS IS NOT A PERMIT

HYDRAULIC DREDGING FOR RESTORATION OF SHIPSHEWANA LAKE AND WETLAND ENHANCEMENT AND WETLAND CREATION IN SARA DAVIS DITCH AT SHIPSHEWANA, INDIANA.

- Shipshewana Community Lake Improvement, 3485 North 980 West, Shipshewana, Indiana, has applied to this office for a Department of the Army permit to be considered under authority of Section 404 of the Clean Water Act to discharge material associated with excavating sediment in Shipshewana Lake; enhancing wetlands; and creating wetlands in the Sara Davis Ditch, a tributary of Shipshewana Lake, Section 4,9,10, T37N, R8E, Shipshewana, Lagrange County, Indiana. The work sites are located at Shipshewana Lake, seventeen miles east of Elkhart, Indiana.
- As shown on the attached plans, the applicant proposes to Discharge fill associated with hydraulic dredging of 350,000 cubic yards of sediment from 200 acres of Shipshewana Lake with contained disposal on adjacent upland, non-wetland farm fields; settled water from the disposal area would be returned through an existing culvert to Shipshewana Lake; excavation and redistribution of 1,440 cubic yards of material associated with the enhancement of 1.2 acres of existing wetland and adjoining upland for its enlargement to 2.0 acres; excavation and redistribution of 6,664 (cut) and 339 (fill) cubic yards of material from 0.10 acres of Sara Davis Ditch and adjoining upland to create 1.7 acres of wetland and pond area. The purpose of the work is to improve water quality and the recreational value of Shipshewana Lake and to create wildlife habitat and new environmental education opportunities.
- Water quality certification (or waiver thereof) is required from the State of Indiana, Department of Environmental Management.
- The applicant has either received or requested the following governmental authorization:

Indiana Department of Natural Resources - Change in Public Freshwater Lake, IC 14-26-2 with 310 IAC 6-2.

- 5. We are publishing this notice in compliance with Title 33 Code of Federal Regulation Parts 320-330. Any interested parties and agencies desiring to express their views concerning the proposed work may do so by written comment to the Chief, Permit Evaluation Section A, Regulatory Branch, Construction-Operations Division, Detroit District Corps of Engineers, Box 1027, Detroit, Michigan 48231, postmarked or delivered in person no later than the expiration date of this public notice. Comments of a positive or negative nature may be submitted. We will interpret a lack of response as meaning that there is no objection to the permit application.
- 6. Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this application. Request for public hearings shall state, with particularity, the reasons for holding a public hearing.
- The decision whether to issue the permit will be based on an evaluation of the probable impact of the activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and, in general, the needs and welfare of the people.
- 8. We will review this application for the potential impact on threatened or endangered species pursuant to Section 7 of the Endangered Species Act as amended. If we determine that the proposed activity may jeopardize the continued existence of listed species or destroy or adversely modify their critical habitat, we will initiate formal consultation procedures with the U.S. Fish and Wildlife Service.
- 9. This activity involves the discharge of dredged or fill material into waters of the United States. Therefore, our

evaluation of the impact of the activity on the public interest will include application of the guidelines promulgated by the Administrator, EPA, under the authority of Section 404(b)(1) of the Clean Water Act.

- 10. The District Staff has reviewed existing information on historic properties potentially affected by the proposed project, including the National Register of Historic Places. The following is our current knowledge of the presence or absence of historic properties and the effects of the undertaking upon these properties: There are no recorded historic properties within the permit area. The permit area has been so extensively modified by modern development that little likelihood exists for the proposed project to impinge upon an undisturbed historic property. The District Engineer invites responses to this Public Notice from federal, state and local agencies, historical and archaeological societies, Indian tribes, and other parties likely to have knowledge of or concerns with historic properties in the area.
- 11. The Corps of Engineers is soliciting comments from the public; Federal, State, and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

12. Additional information concerning this application may be obtained from Thomas E. Allenson, Project Manager, at the Corps of Engineers address listed above, or telephone number (313) 226-2222.

FOR THE DISTRICT ENGINEER:

John Konik

Chief, Permit Evaluation Section A Regulatory Branch

a Louis

NOTICE TO POSTMASTERS:

We request that this notice be conspicuously and continuously posted for 20 days from the date of issuance.



DEPARTMENT OF THE ARMY

DETROIT DISTRICT, CORPS OF ENGINEERS BOX 1027

DETROIT, MICHIGAN 48231-1027

IN REPLY REFER TO

September 24, 1997

Construction-Operations Division Regulatory Branch File No. 97-144-034-0A

F.X. Browne, Inc. P.O. Box 401 Lansdale, Pennsylvania 19446

Dear Sir or Madam:

We have reviewed your application on behalf of the Shipshewana Community Lake Improvement Association for a Department of the Army permit to discharge material associated with excavating sediment in Shipshewana Lake; enhancing wetlands; and creating wetlands in and adjacent to Sara Davis Ditch at Shipshewana, Indiana. In order to continue processing the application, we require the following information:

- a. There are a number of details which are missing or not apparent from the application and drawings. In order to avoid confusion about the nature of the missing information, we have attempted to complete the attached rough draft of a narrative description of the project. This description would be used in our forthcoming public notice, project evaluation, and permit document, if issued. We have left blanks where information is required to make the application administratively complete. Please redo the narrative with the missing information filled in, or, if the narrative otherwise accurately describes the project, you may simply fill in the blanks and return it to us. Also, we have had to make some assumptions about the sequence of work which you propose, since we must evaluate and permit certain specific methods and temporary structures. Where these details are incomplete or our assumptions are not correct, please revise the narrative.
- b. Has a wetland delineation been completed for the elementary school site, the Sara Davis Ditch site, or the proposed sediment disposal area? What area of the Sara Davis Ditch itself would be excavated? Would any existing water channel areas in the sediment disposal site be filled or other wise affected by the project? We note that hydric soils are mapped for portions of all three of these work areas. The local office of the Natural Resources Conservation Service (NRCS) in Lagrange County should have records regarding cropping history and may have completed wetland delineations for some of these

IN 1337-02 DUH SKO AKITM SEP 29 1997 areas. If your firm or others have completed wetland delineations, please provide data sheets regarding vegetation, soils, and hydrology to our office.

Please provide the above information within 30 days from the date of this letter. If you need additional time, please request it, providing the reason(s) for the delay and time required. If we do not hear from you, we will withdraw your application. Your response and any questions should be directed to Thomas E. Allenson, Project Manager, at the above address or telephone (313) 226-2222. Please refer to File Number: 97-144-034-0A.

Sincerely,

John Konik

John Komik

Chief, Permit Evaluation Section A Regulatory Branch

Enclosure

Copy Furnished:

Shipshewana Community Lake Improvement Assoc., (M. Martin) NRCS Lagrange County (B. Bortner), w/location maps



F. X. Browne, Inc.

Engineers • Planners • Scientists

August 26, 1997

Mr. John Konik United States Army Corps of Engineers Detroit District Regulatories Function Branch P.O. Box 1027 Detroit, MI 48231

RE:

Shipshewana Lake Restoration Project

Dredging and Constructed Wetlands Permitting

FXB File No. IN1337-02

Dear Mr. Konik

The attached "Application for Department of the Army Permit" (33 CFR 325) is being submitted for a USACE Individual Permit. The permit application pertains to the proposed dredging of Shipshewana Lake and the proposed construction of two wetlands in the Shipshewana Lake watershed in LaGrange County, Indiana.

The dredging will be conducted using a hydraulic dredge and will remove approximately 350,000 cubic yards of nutrient-rich, accumulated sediment from the bottom of the lake. The wetlands construction will involve the creation of a wetland area in the Sara Davis Ditch and the enhancement of a wetland area at the Shipshewana Elementary School which is currently used for stormwater treatment. Both the dredging and the constructed wetlands will improve the water quality and recreational value of Shipshewana Lake. Other benefits of the constructed wetlands include flood control, creation of wildlife habitat, aesthetic enhancement, and the creation of environmental education opportunities.

If you have any questions or concerns during the review period, please do not hesitate to call me.

Sincerely.

F. X. BROWNE, INC.

Donna I. Hegge

By:

Donna L. Hegge

/dlh

CC:

Enclosures

Michael Martin, SCLIA Michael Massonne, IDNR Division of Soil Conservation Engineer

Scott McClarney, IDNR Division of Water

P.O. Box 401 • Lansdale, PA 19446 • (215) 362-3878 • Fax (215) 362-2016

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT (33 CFR 325)

OMB APPROVAL NO. 0710-003 Expires October 1996

Public reporting burden for this collection of information is estimated to average 5 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of InformationOperations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003), Washington, DC 20503. Please DO NO RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authority: 33 USC 401, Section 10; 1413, Section 404. Principal Purpose: These laws require permits authorizing activities in, or affecting, navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Routine Uses: Information provided on this form will be used in evaluating the application for a permit. Disclosure: Disclosure of requested information is voluntary. If information is not provided, however, the permit application cannot be processed nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

activity. An application that is	not completed in full will be returned.		
	(ITEMS 1 THRU 4 TO	O BE FILLED BY THE CORPS)	
1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETED
	(ITEMS BELOW TO	BE FILLED BY APPLICANT)	
	nity Lake Improvement ael Martin, President	8. AUTHORIZED AGENT'S N F. X. Browne,	IAME AND TITLE (on agent is not required)
6. APPLICANT'S ADDRESS 3485 North 980 We Shipshewana, IN		9. AGENT'S ADDRESS P.O. Box 401 Lansdale, PA	19446
7. APPLICANT'S PHONE NOS	S. W/AREA CODE	10. AGENT'S PHONE NOS.	W/AREA CODE
a. Residence 219/768	3-4541 (after 4:30 p.m.)	a. Residence	
b. Business 219/593	-2500 ×347	b. Business 215/362	-3878
11.	STATEMENT	OF AUTHORIZATION	
	Browne, Inc. mental information in support of this perm	it application.	ant in the processing of this application and to $\frac{3-/9-9.7}{\text{DATE}}$
	NAME LOCATION AND DES	CRIPTION OF PROJECT OR ACTI	VITY
12. PROJECT NAME OR TITI			
Shipshewana Lake	e Restoration Project		
13. NAME OF WATERBODY Shipshewana Lake Sara Davis Ditch	e, Cotton Lake,	14. PROJECT STREET ADD	RESS (if applicable)
15. LOCATION OF PROJECT	•	See #6 above an	nd attached Block #17
LaGrange COUNTY	INSTATE	-	
	CRIPTIONS, IF KNOWN, (see instructions) S - Sec. 10, T.37N., R.8E , 9 & 10, T.37N, R.8E	ediment Disposal Area Latitude - ^L Longitude -	a - Sec. 4, T.37N, R.8E. +10 41' 30'' 85° 36' 14''
17. DIRECTIONS TO THE S	ITE	`	

See attached Block #17

10.	Nature Of Activity (Description of project, include all features)
	See attached Block #18
19.	Project Purpose (Describe the reason or purpose of the project, see instructions)
	See attached Block #19
20	USE BLOCKS 20-22 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED Reason(s) for Discharge
	N/A
21.	Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards
	N/A
22.	Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)
	N/A
23.	Is Any Portion of the Work Already Complete? Yes No _X IF YES, DESCRIBE THE COMPLETED WORK
24.	Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (If more than can be entered here, please attach a supplemental list).
	See attached Block #24
	·
25.	List of Other Certifications or Approvals/Denials Received from other Federal, State or Local Agencies for Work Described in This Application.
	AGENCY TYPE APPROVAL* IDENTIFICATION NUMBER DATE APPLIED DATE APPROVED DATE DENIED
	See attached Block #25
•Wo	ould include but is not restricted to zoning, building and flood plain permits
26.	Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.
	8-1/0-97
	SIGNATURE OF APPLICANT DATE SIGNATURE OF AGENT DATE
	The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.
	18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States

knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than \$10,000 or imprisoned not more than five years or both.

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT (33 CFR 325)

OMB APPROVAL NO. 0710-003 Expires October 1996

Public reporting burden for this collection of information is estimated to average 5 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of Information/Departions and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003), Washington, DC 20503. Please DO NO RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authority: 33 USC 401, Section 10; 1413, Section 404. Principal Purpose: These laws require permits authorizing activities in, or affecting, navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Routine Uses: Information provided on this form will be used in evaluating the application for a permit. Disclosure: Disclosure of requested information is voluntary. If information is not provided, however, the permit application cannot be processed nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

	(ITEMS 1 THRU 4	TO BE FILLED BY THE CORPS)	
1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETED
	(ITEMS BELOW	TO BE FILLED BY APPLICANT)	
5. APPLICANT'S NAME Shipshewana Commu Association, Mich	unity Lake Improvement nael Martin, President	8. AUTHORIZED AGENT'S NAM F. X. Browne, In	ME AND TITLE (an agent is not required)
6. APPLICANT'S ADDRESS 3485 North 980 We Shipshewana, IN		9. AGENT'S ADDRESS P.O. Box 401 Lansdale, PA 19	9446
7. APPLICANT'S PHONE NO		10. AGENT'S PHONE NOS. W/	AREA CODE
a. Residence 219/768	3-4541 (after 4:30 p.m.)	a. Residence	
b. Business 219/593	3-2500 ×347	b. Business 215/362-3	3878
11.		T OF AUTHORIZATION	
I hereby authorize, F. X. furnish, upon request, suppler	mental information in support of this per	mit application.	in the processing of this application and to -/9-97 DATE
	NAME LOCATION AND D		
12. PROJECT NAME OR TITI		ESCRIPTION OF PROJECT OR ACTIVIT	1 Y
	Restoration Project		
13. NAME OF WATERBODY, Shipshewana Lake Sara Davis Ditch	e, Cotton Lake,	14. PROJECT STREET ADDRES	SS (if applicable)
15. LOCATION OF PROJECT		See #6 above and	attached Block #17
LaGrange COUNTY	IN STATE	_	
	CRIPTIONS, IF KNOWN, (see Instructions) Sec. 10, T.37N., R.8E, 9 & 10, T.37N, R.8E	Longitude - 0	Sec. 4, T.37N, R.8E.
17. DIRECTIONS TO THE SI	TE	`	

See attached Block #17

18.	Nature of Activity (Description of project, include all fe	etures)			
	See attached Block #18				
19.	Project Purpose (Describe the reason or purpose of the	project, see instructions)			
	See attached Block #19				
		-22 IF DREDGED AND/OR FILL	MATERIAL IS TO BE	DISCHARGED	
20.	Reason(s) for Discharge				
	N/A				
21.	Type(s) of Material Being Discharged and the	Amount of Each Type in Cubic	Yards		
	N/A				
22.	Surface Area in Acres of Wetlands or Other V	Vaters Filled (see instructions)			
	N/A				
23.	Is Any Portion of the Work Already Complete	? Yes No _X	IF YES, DESCRIBE T	HE COMPLETED WOR	K
24.	Addresses of Adjoining Property Owners, Less please attach a supplemental list).	sees, Etc., Whose Property Ad	joins the Waterbody	(If more than can be e	intered here,
	See attached Block #24				
			b		
25.	List of Other Certifications or Approvals/Deni-	als Received from other Federa	I, State or Local Age	encies for Work Descri	bed in This Application.
	AGENCY TYPE APPROVAL*	IDENTIFICATION NUMBER		DATE APPROVED	DATE DENIED
	See attached Block #25				
•w	ould include but is not restricted to zoning, bui	lding and flood plain permits			
26.	Application is hereby made for a permit or pe application is complete and accurate. I furthe duly authorized agent of the applicant.	rmits to authorize the work de er certify that I possess the au	scribed in this applic thority to undertake	ation. I certify that th the work described he	e information in this rein or am acting as the
	SIGNATURE OF APPLICANT	DATE	SIGNATURE O	F AGENT	DATE
	The application must be signed by the person authorized agent if the statement in block 11	who desires to undertake the has been filled out and signed	proposed activity (a	pplicant) or it may be s	signed by a duly
	18 U.S.C. Section 1001 provides that: Whoe knowingly and willfully falsifies, conceals, or fraudulent statements or representations or r fraudulent statements or entry, shall be fined	covers up any trick, scheme, o nakes or uses anv false writing	r disguises a materia I or document knowi	al fact or makes any fa ing same to contain an	lea fictitique or

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT (33 CFR 325) - INDIVIDUAL PERMIT

Shipshewana Lake Restoration Project FXB File No. IN1337-02

Block #17 - Directions to the Sites

Shipshewana Lake - From the town of Shipshewana, take 250 North Road west to 1000 West Road. Turn right onto 1000 West Road and continue to Levi Lane. Turn right onto Levi Lane. Follow Levi Lane until it turns right and becomes Vacation Way. Bear right at the fork in Vacation Way onto 4th of July Avenue. Follow 4th of July Avenue to the public park.

<u>Sediment Disposal Area -</u> From the town of Shipshewana, take 250 North Road west to 1000 West Road. Turn right onto 1000 West Road and continue to Levi Lane. Turn right onto Levi Lane. The disposal area is on the farm owned by Levi A. Miller located at the intersection of Levi Lane and Vacation Way.

<u>Shipshewana Elementary School Site (Wetland Enhancement) - The Shipshewana Elementary School is located on 250 North Road near the intersection of 250 North Road and Route 5. The existing wetland is behind the school at the rear of the school property.</u>

<u>Sara Davis Ditch Site (Wetland Creation)</u> - The Sara Davis Ditch flows from Cotton Lake to Shipshewana Lake, and is located in Newbury, Indiana. From the town of Shipshewana, take 250 North Road west to 900 West Road. Turn right onto 900 West Road and park at the Berea Missionary Church at that intersection. Cross 250 North Road and the 600 foot section of Sara Davis Ditch is just south and adjacent to 250 North Road.

Block #18 - Nature of Activities

The Shipshewana Lake Restoration Project consists of several water quality improvement measures. Already underway is the stabilization of approximately 4,500 feet of the lake's western and northeastern shoreline using coir fiber bundles and wetland vegetation. This permit application pertains to the dredging of the lake, the creation of one wetland in the Sara Davis Ditch and the enhancement of an existing wetland at the Shipshewana Elementary School which is currently used for stormwater treatment.

Lake Dredging -

See Attachment #1 - Lake Dredging Plans. The hydraulic dredging of Shipshewana Lake will involve a free-moving, floating dredge which contains a long arm with a cutterhead attached to the end. The water level of the lake will not be altered during the dredging operation. The dredge will travel around the lake, positioning its arm so that the cutterhead can reach the sediment at the bottom of the lake. The cutterhead will dig up the sediment and the pump on board the dredge will suck the sediment into the dredge discharge pipeline. The sediment will be transported as a slurry through the dredge discharge pipeline to the upland sediment disposal area. The dredge will continue to work in an area until the specified water depths are achieved. The hydraulic dredge will remove only accumulated sediments from the lake bottom and the original lake bed will remain undisturbed.

The sediment disposal area covers approximately 23 acres of agricultural land located about 400 feet from the lake and about 17 feet higher than the normal water level elevation of the lake. The sediment will be dewatered through the use of either sedimentation/disposal basins or a new sediment dewatering process.

The sedimentation/disposal basins will be constructed in the sediment disposal area by cutting and filling the existing soil. The dredge discharge pipeline will deposit the sediment slurry into the basins, the detention time of the basins will be sufficient to allow the sediment to settle out of the slurry, and the clarified water will return to the lake via a weir, a pipeline and a pipe outlet riprap apron. The sediment will remain in the basins until they are sufficiently dewatered to allow the area to be regraded and returned to its former use as agricultural land.

The feasibility of using the new sediment dewatering process for this project is currently being assessed. The process involves a belt filter press housed in an 18-wheeler truck trailer. The dredge discharge pipeline will deposit the sediment slurry into the trailer, the process will remove the water from the sediment, and the clarified water will return to the lake via a pipeline and a pipe outlet riprap apron. The sediment will emerge from the end of the trailer in a solid state. The sediment will then be regraded over the disposal area and the area will be returned to its former use as agricultural land. The dewatering process has two main advantages over the use of sedimentation/disposal basins from the design point of view; the process eliminates the extensive earthwork needed to construct the basins and the time required to allow the sediment to dewater.

A detailed bathymetric survey conducted on Shipshewana Lake in June of 1996 revealed approximately 1,183,000 cubic yards of accumulated sediment in the lake. Due to disposal area and financial constraints, approximately 350,000 cubic yards of sediment will be dredged from the lake. Shipshewana Lake will be dredged in four main areas: adjacent to the dam, adjacent to the Sarah Davis Ditch, in the northwest corner of the lake, and in the middle of the lake. The details of each dredging area are presented below.

Area	Depth of Dredging Below Normal Water Level (ft)	Average Sediment Thickness (ft)	Sediment Volume (cy)
Adjacent to Dam	8	3	54,900
Adjacent to Sarah Davis Ditch	6	2	22,100
Northwest Corner of Lake	7	2.5	74,900
Middle of Lake	16	5	194,700
Total			346,600

A composite sediment sample was collected during the October 1995 site visit by mixing three discrete sediment samples. The composite sample was sent to an analytical laboratory and tested for particle size distribution, hazardous metals, pesticides, herbicides, nitrate and phosphorus. Based on the particle size distribution, the composite sediment sample is 70.7% sand and 29.3 % silt and clay. The remaining analytical results are presented below.

Parameter	Concentration (mg/kg)*
RCRA Metals - Total Analysis Arsenic	0.466
Barium	<50.0
Cadmium	<1.00
Chromium	<1.00
Lead	<2.00
Mercury	<0.070
Selenium	<0.200
Silver	<1.00
Nutrients Nitrate as Nitrogen	<2.1
Phosphate as phosphorus (solid)	27
Herbicides 2,4,5 - TP (solid)	<0.0002
2,4 - D (solid)	<0.0005
Priority Pollutant List Pesticides a - BHC	<0.0080
b - BHC	<0.0080
d - BHC	<0.0080
g - BHC (Lindane)	<0.0080
Heptachlor	<0.0080
Aldrin	<0.0080
Heptachlor epoxide	<0.0080
Endosulfan I	<0.0080
Endosulfan II	<0.0160
Dieldrin	<0.0160
Endrin	<0.0160
Endrin Aldehyde	<0.0160

Parameter	Concentration (mg/kg)*
4,4' - DDE	<0.0160
4,4' - DDD	<0.0160
4,4' - DDT	<0.0160
Endosulfan sulfate	<0.0160
Chlordane	<0.0800
Toxaphene	<0.1600
PCBs PCB - 1016	<0.0800
PCB - 1221	<0.0800
PCB - 1232	<0.0800
PCB - 1242	<0.0800
PCB - 1248	<0.0800
PCB - 1254	<0.1600
PCB - 1260	<0.1600

<X = Not detected; value indicates minimum quantifiable limit.

Shipshewana Elementary School Constructed Wetland (Wetland Enhancement) -

See Attachment #2 - Shipshewana Elementary School Constructed Wetland Plans. The existing constructed wetland area in the rear of the Shipshewana Elementary School is currently unsatisfactory for the treatment of urban stormwater from the 50 acre watershed (see the following photographs). This system will be reconstructed and enlarged to provide adequate treatment with relatively simple, low-cost maintenance. A sediment forebay will be added to settle suspended particles from incoming stormwater to prevent clogging of the entire system. The forebay is sized accordingly for accessible, periodic removal of accumulated sediments by small equipment. The remainder, and largest portion of the wetland system, will be enlarged and vegetated. This portion will be responsible for the biological removal of nutrients and other pollutants, as well as the further settling of fine suspended particles.

The existing wetland is approximately 1.2 acres in size and consists of a mud flat area surrounded by wetland vegetation. The wetland system does not function well to remove sediments and nutrients from the stormwater directed to the site. Based on the methodology for sizing wetlands presented by Schueler, 1992, the area needed to provide adequate treatment for the 50 acres draining to the existing stormwater management facility is 0.5 acres. This area was calculated assuming that the 50 acres

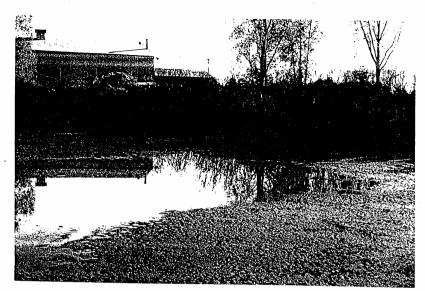


Photo 1: View of the existing school wetland.



Photo 2: View of the existing school wetland.

draining the area is approximately 90 percent impervious. The 6 month, 24 hour storm volume was calculated to be 1.7 inches using information provided by the Soil Conservation Service TR-55 Model and in "Constructed Wetlands for Storm Runoff Water Quality Control" (Horner, 1993). Since approximately 4 acres are available at the school site for a constructed wetland system, this is a feasible site. Based on the calculations, the constructed wetland only requires 0.5 acres; however, if the wetland system is designed to be larger and have a longer hydraulic residence time, the pollutant removal efficiencies will increase and more dissolved pollutants such as nitrogen and phosphorus will be removed (Horner, 1993).

The existing 1.2 acre stormwater wetland will be replaced with a 2.0 acre wetland that will consist of a forebay to settle out large solids, a wetland zone to remove smaller sediments and nutrients, and a micro-pool (exit pond) to remove additional suspended matter. Wetland vegetation will be planted in the area according to the planting plan. The design of the wetland system also includes an emergency bypass for larger storms so that the wetland system is not washed out.

Sara Davis Ditch Constructed Wetland (Wetland Creation) -

See Attachment #3 - Sara Davis Ditch Constructed Wetland Plans. The Sara Davis Ditch is a county regulated drainageway which flows from Cotton Lake to Shipshewana Lake. It is one of two inlets to Shipshewana Lake. A 600 foot section of this "ditch" adjacent to and south of Route 250 currently serves as a water conveyance channel and provides no pollutant removal. In fact, the current erosion of this ditch during stormflows is contributing nutrient and sediment pollution to Shipshewana Lake. A properly designed constructed wetland system in this area would be capable of removing high concentrations of nutrients, suspended particles, and other pollutants from approximately 2,100 acres of the Shipshewana Lake watershed. The drainage easement is 150 feet wide at this site; therefore, a 2.1 acre area is available for a constructed wetland system.

The wetland area required for treating the drainage from the 2,100 acre watershed to the Sara Davis Ditch site is 15 acres based on standard calculations for sizing wetlands. However, the topography and peaking factors for this agricultural portion of Indiana are significantly different than average conditions, and standard runoff equations do not adequately reflect the actual runoff in the area. According to Rex Pranger, LaGrange County Engineer, there is significant depression storage within the watershed by natural depressions, man-made farm ponds and Cotton Lake; therefore, the time of concentration to the Sara Davis Ditch location is extremely long and storm peaks are spread out over time. Mr. Pranger indicated that the water level in the Sara Davis Ditch at the proposed wetland site does not increase significantly during storm events. Occasionally during a very large storm event or during a high snow melt event, the water in the Sara Davis Ditch only slightly overflows its banks. Based on this information and on our field evaluation of this site, we feel that the 2.1 acre area that is available at this site would be adequate for a constructed wetland treatment system.

A 1.7 acre pond-wetland system specifically for the removal of agricultural associated pollutants will be constructed in the Sara Davis Ditch. An enlarged sediment forebay will be installed to enhance the removal of suspended particles. The remaining portion of the system will be vegetated according to the planting plan for the biological removal of nutrients and other pollutants. Instead of a single channel running uncontrolled through the area, the system will detain and control stormflows, evenly discharging water to a densely vegetated, meandering system. Treatment is essential at this location since there is significant agricultural activity in this portion of the watershed. Fertilizing and soil disturbance associated with farming methods used by local farming operations introduces high concentrations of sediments and nutrients to the Sara Davis Ditch.

Block #19 - Project Purpose

Shipshewana Lake is approximately 205 acres in size and was created in the early 1960's through the installation of a sheet pile dam. This dam discharges into Page Ditch, the only outlet of the lake. Shipshewana Lake has two inlets: Sara Davis Ditch on the south side, and Mud Lake Ditch on the west side.

The Shipshewana Lake Watershed encompasses approximately 4,675 acres, with predominantly agricultural land uses. However, low density residential use is increasing. The land adjacent to the lake is heavily developed with single family residences and a church camp. The eastern shore was developed in the mid 1960's. At that time, the marsh that existed at the mouth of Mud Lake Ditch was filled in with material dredged from the lake. The northeastern shoreline was developed in the late 1960's, and was originally used for pasture land. Three channels have been excavated at the north end of the lake for access to new development.

Since the late 1970's, the water quality and general condition of Shipshewana Lake has declined dramatically. In 1986, the lake was classified as a Class Three Lake, which is considered an advanced eutrophic lake of the lowest quality (Indiana Department of Environmental Management, Indiana Lake Classification System and Management Plan). It was classified this way due to a total phosphorus concentration of 0.045 mg/l and a Secchi disc transparency of 3 feet. A Eutrophication Index value of 51 was calculated for the lake (scale 0 to 75). In addition, extreme blue-green algae blooms are common during the growing season resulting in Secchi disc transparency readings of 0.5 feet.

A thick, unconsolidated layer of organic sediment exists on the lake bottom all year round. During peak growing season anoxic conditions persist in this layer as well as in the water column above it. As a result, lake use has suffered, swimming has been banned, boating is hampered due to algae scums and fishing has declined. The receiving streams (Page Ditch, Pigeon River) are impacted as well.

The purpose of the shoreline stabilization has been summarized in a separate permit application prepared for that aspect of the project. The purpose of lake dredging is to remove accumulated sediment, and associated nutrients, from the lake in order to restore the original contours of the lake. The purpose of the constructed wetlands is to clarify, filter and biologically treat the sediment, nutrients and other pollutants present in stormwater runoff in the Shipshewana Lake watershed before this water reaches the lake. Lake dredging and constructed wetlands will help improve the water quality and restore the recreational value of the lake.

The construction of the wetlands is scheduled to begin in the spring of 1998 and will be completed in the summer of 1998. The lake dredging is scheduled to begin in the fall of 1997 and be completed in the fall of 1998. If sedimentation/disposal basins are used for the lake dredging, the time it will take the sediment to sufficiently dewater to regrade the disposal area and return it to its original use is highly variable. It depends on the dewatering characteristics of the sediment dredged, the weather conditions, the permeability of the soil on which the basins are constructed, and the depth of sediment in the basins. If the new sediment dewatering process is used for lake dredging, the disposal area should be regraded and returned to its original use in the fall of 1998.

Block #24 - Addresses of Adjoining Property Owners

Following is a list of the complete names and full mailing addresses of the adjacent property owners (public and private), whose property adjoins Shipshewana Lake, the sediment disposal area, the Shipshewana Elementary School Constructed Wetland site or the Sara Davis Ditch Constructed Wetland site

Shipshewana Elementary School Constructed Wetland -

Westview School Corporation 1545 S 600 W Topeka, IN 46571

Next Door L.L.C. 15144 C.R. 34 Goshen, IN 46526

Pletcher, Delmer J. Pletcher, Lester and Erma 8300 W 250 N Shipshewana, IN 46565 Trading Place L.L.C. P.O. Box 185 Shipshewana, IN 46565

Yoder, Grace N., Grace Yoder Trust P.O. Box 245 Shipshewana, IN 46565

Sara Davis Ditch Constructed Wetland -

LaGrange County Drainage Board 114 West Michigan Street LaGrange, IN 46761

Berea Missionary Church/Board of Trustees 2525 N 900 W Shipshewana, IN 46565

Mast, Melvin J. 1695 N 850 W Shipshewana, IN 46565 Stultzfus, Merl D. 8895 W 250 N Shipshewana, IN 46565

2520 N 250 W

Shipshewana Lake and the Disposal Area -

See the following list.

Pletchek, Dwayne and Areta P.O. Box 6 Shipshewana, IN 46565

Prough, Malcolm D., Living Trust

Shipshewana, IN 46565

Ackmann, Ruth A. 121 Fellows Court Elmhurst IL, 60126

Bills Ronald & Viola 9045W 270N Shipshewana IN 46565

Aman Robert F. & Beverly J. 27228 CO RD #4 Elkhart IN 46514 Blough Stephen & Nancy 2805N 920W Shipshewana IN 46565

Andresen, Paula 137 Kenwood Elkhart IN 46517 Bolen Randy 2830N 905W Shipshewana IN 46565

Arbogast Janis 916W 250N Shipshewana IN 46565 Bolen Devota 9040W 280N Shipshewana IN 46565

Arbuckle Robert 12 Kennedy Lane Elkhart IN 46514 Bontrager Richard & Shelia 2770N 920W Shipshewana IN 46565

Baker Cecil G. & Lavonne 2 Bass Lake Drive DeBary FL 32712 Bontreger Jonas E. & Betty Sue 16002 CR 34 Goshen IN 46526

Bayless Larry D. & Charlotte 3300 N 980 W Shipshewana IN 46565 Bowen Robert S. & Sharon 3480N 915W Shipshewana IN 46565

Bickley Brian A. & Kelly K. 3345 N 980 W Shipshewana IN 46565 Bowers Donald E. & Jerrilyn c/o Trover, Paul C. & Melinda S. 3025 N 980 W Shipshewana IN 46565 Boyland Stanley R. & Phyllis E. 9200 W 360 N Shipshewana IN 46565

Butler Donald N. & Bernice E. 1423 Ceder Street Elkhart IN 46514

Brethren Conference of Indiana 9095W 275N Shipshewana IN 46565

Carpenter Dail & Alverna K. 9150 W 375 N Shipshewana IN 46565

Brown Donald L. & Doris A. 32957 Eby Road Bristol IN 46507

Carpenter Jeffrey A. & Brenda J. 9290 W 375 N Shipshewana IN 46565

Brown Robert M. & Donna 9175 W 375 N Shipshewana IN 46565 Carpenter William Dail 9150 W 375 N Shipshewana IN 46565

Buckley Kenneth W. & Geraldine 9039 Cottage Grove Place Highland IN 46322

Chubb Eli & Anna 3530N 1000W Shipshewana IN 46565

Burgoon Wayne & Nadine 9130W 270N Shipshewana IN 46565 Claxton Richard & Barbara 15650 Dickinson Road White Pigeon MI 49099

Burgoon L. Robert & Carola 9135W 270N Shipshewana IN 46565 Clevenger Sammy & Peggy 9140W 270N Shipshewana IN 46565

Butcher Danny & Marlene 4627E 200S Shipshewana IN 46565

Columbia Realty Corp. P.O. Box 52 North Manchester IN 46962 Crockett Matthew & Tina 2740N 920W

Shipshewana IN 46565

Eash Christopher 4960N 450W

Shipshewana IN 46565

Davis Dennis & Vicky 3105N 982 W

Shipshewana IN 46565

Eicher Katherine & Joan Eash

27913 M-86

Burr Oak MI 49030

Dillon Robert 3035N 900W

Shipshewana IN 46565

Elkins Charles & Betty

3230N 915W

Shipshewana IN 46565

Donahue Myrtle C. c/o Robert H. Penning 529 W Centre

Portage MI 49081

Elliott Larry & Irene

3245N 915W

Shipshewana IN 46565

Doty Stanley A. 2805N 905W

Shipshewana IN 46565

Everitt Rachel 9115W 280N

Shipshewana IN 46565

Draves Frederic & Christaine 9155W 280N

Shipshewana IN 46565

Everts Biruta 3460N 920W

Shipshewana IN 46565

Duney Carl F. & Ervina 1215 Rensselaer Griffith IN 46319

Everts Ronald Jack & Julia Ann

348 0N 920W

Shipshewana IN 46565

Dunithan Virginia 2830N 905W

Shipshewana IN 46565

Fox Howard & Vera c/o Martha Ellis 1020 S. Yorkchester Yorktown IN 47396 Friesner Ralph R. & H. Kathleen 408 State Street Elkhart IN 46514 Gruszczyk Stanley T. & Helen P.O. Box 662 Shipshewana IN 46565

Frisk Steve A. & Barbara A. 3425 N 980 W Shipshewana IN 46565 Harpe Edward R. & Verneal M. 9250 W 360 N Shipshewana IN 46565

Fulks Mark & Marla 9075W 280N Shipshewana IN 46565 Harper R. Burton & Candace E. 969 Bell Avenue Pittsburgh PA 15243

Gaudreau Wayne 9010W 280N Shipshewana IN 46565

Hartford Clark G. & Avon S. 160-C Pelham Lane Jamesburg NJ 08311

Gingerich Clarence & Frieda 3280 N 1000 W Shipshewana IN 46565 Heminger James 29975 CR 22-W Elkhart IN 46517

Girten Ruth E. 3285 N 980 W Shipshewana IN 46565 Henriken Kurt 5731 W. Eagle Lake Road Peotone IL 60468

Glick Elmer J. & Ruth M. P.O. Box 13 Shipshewana IN 46565

Hillman Kathy 5064 Park Avenue Portage IN 46368

Gradow Gordon & Milena 2315 Sherwood Road Arlington Heights IL 66604

Hjerpe William B. & Jacqueline J. 576 W 100 S Hebron IN 46341 Hochstetler Calvin A. & Linda S. 3405 N 980 W Shipshewana IN 46565

Hoogenboom Steven 23051 Rebecca Drive Elkhart IN 46517

Hostetler Donald c/o Yoder, Bennie & Christine 2746 920W Shipshewana IN 46565

Houlihan Thomas 3919 Henry Street, SW Grandville MI 49418

Hout Richard & Ruth 9050W 280N Shipshewana IN 46565

Howard John D. & Beatrice P.O. Box 467 Shipshewana IN 46565

Huenerkopf Jane 9050W 265N Shipshewana IN 46565

Hunn Kenneth 555 West Market Street Nappanee IN 46550 Hydorn Gerald 313 Mcomber Street Dowagiac MI 49047

Jankowski Michael & Doretta 9175W 270N Shipshewana IN 46565

Jewett Michael R. & Barbara L. 1405-2 Pembroke Circle Goshen IN 46526

Johnson Luanne c/o Lewis Petit 320 Westlawn Drive Mansfield OH 44906

Johnson Irene 3325N 920W Shipshewana IN 46565

Jones Ezra 57394 CR 7 Goshen IN 46526

Jones Jack M. & Nancy E. 2506 Frances Avenue Elkhart IN 46514 Kauffman Janet 7195N 675W Shipshewana IN 46565 Long Donald & Majorie c/o Sprong, Roland & Marjorie 12383 CR 30 Middlebury IN 46540

Keller Daniel J. P.O. Box 23 Middlebury IN 46540

Loutzenhiser Keith 3270N 920W Shipshewana IN 46565

Knepp Karol L. & Anna 56381 CR 19 Bristol IN 46507

Lowell Daniel C. 609 W Mishawaka Elkhart IN 46514

Kneynsberg John W. & Elaine L. 19501 South Parker Road Mokena IL 60448

Lunsford Henry 3390N 920W Shipshewana IN 46565

Krahn Robert W. & Sue 3295 N 980 W Shipshewana IN 46565

Lupold Leonard L. Vernon R. Winquist 9085W 280N Shipshewana IN 46565

Krugh Terry & Mary 2605W SR 120 Howe IN 46746

Lupold Julie 10265 Ulmerton Road #130 Largo FL 34641

LaGrange County Park & Recreation 114 West Michigan Street LaGrange IN 46761

Manning James & Betty 214 Poplar West Bryan OH 43506

Leedy Don 2468 Hillwood Drive Maplewood MN 55119 Martin Dennis J. & Kay 3515 N 980 W Shipshewana IN 46565 Michiana Baptist Camp 3150N 915W Shipshewana IN 46565

Martin Michael D. & Rosalee 3485 N 980 W Shipshewana IN 46565 Miller Simon C/P Clyde S & Nettie Miller 2865N 1000W Shipshewana IN 46565

Martin Luren & Ardath 3190N 915W Shipshewana IN 46565

Miller Lynn & Montine 3486N 920W Shipshewana IN 46565

Mast Ezra E. 14723 CR 22 Goshen IN 46526

Miller Levi & Ella 2995N 1000W Shipshewana IN 46565

McFaul Frederick Sarah Spencer Winter 311 Rue Rabelius #1515 South Bend IN 46565

Miller William O. & Josephine C. P.O. Box 45 Nottawa MI 59075

McGuire Michael & Lola 3276N 920W Shipshewana IN 46565 Miller Laverne & Wanda P.O. Box 73 New Paris IN 46553

McKibbin Loy 20713 CR 18 Goshen IN 46526

Miller Jacob 9205W 270N Shipshewana IN 46565

Michael Jon D. 9215 W 360 N Shipshewana IN 46565 Miller John M. & Karen D. 3055 N 928 W Shipshewana IN 46565 Miller Freeman & Linda 3745N 1000W Shipshewana IN 46565

Murphy Michael & Maureen 3366N 920W Shipshewana IN 46565

Miller Lavern R. 3400 N 980 W Shipshewana IN 46565 Murphy Phillip & Nancy 9145W 280N Shipshewana IN 46565

Miller Daniel S. & Mary L. 9155 W 350 N Shipshewana IN 46565

Neeley David 3195 N 982 W Shipshewana IN 46565

Miller Floyd & Betty Fern 10295W 325N Shipshewana IN 46565

Neiswanger Dwayne & Rebecca 9025W 270N Shipshewana IN 46565

Miller Ora M. & Beverly J. 58343 CR 115 Goshen IN 46526

Nisely John L. & Mary Catherine 3445 N 980 W Shipshewana IN 46565

Mills Mildred 1981 Seymour Avenue, Apt. 4 Cincinnati OH 45237

Oswald George A. & Shirley A. 3245 N 980 W Shipshewana IN 46565

Moses Susanne 2775N 910W Shipshewana IN 46565

Overmyer Kenneth W. & Madonna K. P.O. Box 303 Shipshewana IN 46565

Muhnickel Donald & Scherri 11835W 710N Middlebury IN 46540

Overmyer David & Karen P.O. Box 303 Shipshewana IN 46565 Pappas Alex & Donna 29981 CR 18 Elkhart IN 46514 Podell T. George & Janet L. 56911 Hazel Road South Bend IN 46614

Parker David & Carla 2850N 905W Shipshewana IN 46565 Poorman David A. 9130 W 360 N Shipshewana IN 46565

Peffly Sandra 3530N 920W Shipshewana IN 46565 Raber Ervin & Clara P.O. Box 146 Shipshewana IN 46565

Pelfrey Ralph H. & Virginia E. 9150 W 360 N Shipshewana IN 46565 Ramer Gary D. & Janice 22943 CR 36 Goshen IN 46526

Penning Robert & Beatrice 529 W Centre Portage MI 49002 Richards Loren & Florence 54330 Bittersweet Road Mishawaka IN 46544

Peterson David A. 9155 W 360 N Shipshewana IN 46565 Ridenour Jimmy & Carolyn Box 1138 Middlebury IN 46540

Pinkerton Luther C. & Ocia M. 460 Grove Street Constantine MI 49092 Riedeman Douglas & Karen 18205 S. Portage Road Elmore OH 43416

Pinter James & Carolyn 1083 Riverside Drive South Bend IN 46616

Riley Otus & Janet 9207 W 360 N Shipshewana IN 46565 Robarge Paul 01792 CR 450 Edgerton OH 43517

Schultz Steven & Betty 3320N 920W Shipshewana IN 46565

Roberts Fred & Lydia 11300-124 Ave No Lot 108 Largo FL 34648 Sherck Dennis & Susan 3363E SR 44 Connersville IN 47331

Rodkey Russell P.O. Box 296 Burlington IN 46915 Shidler John & Elnora 3255 N 980 W Shipshewana IN 46565

Salisbury Jack D. & Martha M. 56393 Silver Crest Drive Elkhart IN 46514 Shirley Charles L. SR 3280 N 980 W Shipshewana IN 46565

Sautter Jacqueline Box 3 Road H Grelton OH 43523 Shopride Investment Inc. c/o Dan Rieg 5732 Villas Creek Drive Mason OH 45040

Schmucker Wilbur & Ruth Ann 3770N 1000W Shipshewana IN 46565 Slabaugh Glen & Esther 9550W 375N Shipshewana IN 46565

Schmucker Mervin 9075W 270N Shipshewana IN 46565 Slater Howard L. & Janet A. 3065 N 982 W Shipshewana IN 46565

Schrock Felty & Marjorie 2820N 920W Shipshewana IN 46565

Slaughter Lawrence & Bev 1540 Jeanwood Drive Elkhart IN 46517 Smith Richard Snyder c/o Stephanie Weber 60112 S. St. Joseph Street South Bend IN 46614

Smith Junior Paul 9150W 270N Shipshewana IN 46565

Snider Dana 306 Bluebird Lane Middlebury IN 46540

Snooks Ivan & Betty 3015 N 982 W Shipshewana IN 46565

Spreuer Philip & Lucienne 0915N 015E LaGrange IN 46761

Stutzman Gerald 2870N 900W Shipshewana IN 46565

Swartzentruber Simon 2840N 900W Shipshewana IN 46565

Swick Roger & Eunice 2730N 920W Shipshewana IN 46565 Swihart Thomas W. & Sharon Emerson 204 North College Avenue Valparaiso IN 46383

Swihart Wayne & Mildred 1704 Wood Street Valparaiso IN 46383

Swinehart Barbara 2760N 900W Shipshewana IN 46565

Szul William E. & Josephine F. 13745 South Lamon #204 Crestwood IL 60445

Templeton William P. & Cynthia L. 1820W Indiana Avenue Elkhart IN 46516

Thomas Bessie 3430N 920W Shipshewana IN 46565

Torgenson Everett V. 9280 W 360 N Shipshewana IN 46565

Tribble Ronald Lee 2845N 910W Shipshewana IN 46565 Troyer Paul C. & Melinda S. 3025 N 982 W Shipshewana IN 46565 Weirich Joseph & Dorothy 3310N 1000W Shipshewana IN 46565

Vaughn Jerry W. & Cindy 3059 N 982 W Shipshewana IN 46565 Wingard Wilma 3755N 1000W Shipshewana IN 46565

Victor Michael & Veronica 2709 173rd Street Hammond IN 46323 Winquist Vernon R. c/o Al Miller 9030W 280N Shipshewana IN 46565

Walton Laurel 7770N 300W Howe IN 46746

Wirick Marilyn 9185W 270N

Shipshewana IN 46565

Watkins Charles W. II & Patricia L. 3234 N 980 W Shipshewana IN 46565

Wise Wayne & Harriet 3345N 920W Shipshewana IN 46565

Watson David R. & Trisha W. 9165W 280N Shipshewana IN 46565

Yoder Vernon S. & Jacqueline F. 3560 N 920 W Shipshewana IN 46565

Webb Leonard 1334 Wittekind Terrace Cincinnati OH 45224

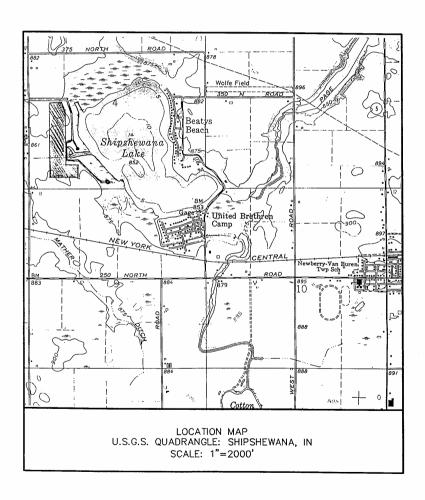
Yoder Benedict & Fannie 2645N 915W Shipshewana IN 46565

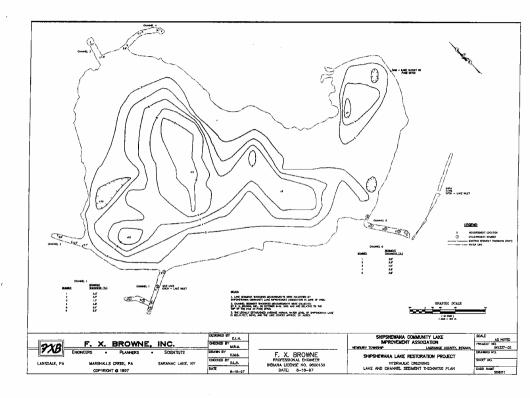
Webb Curtis 2700 16th Avenue South Minneapolis MN 55407 Ziegler David Walter Zakrzewski 3510N 920W Shipshewana IN 46565

Block #25 - Information about Approvals or Denials by Other Agencies

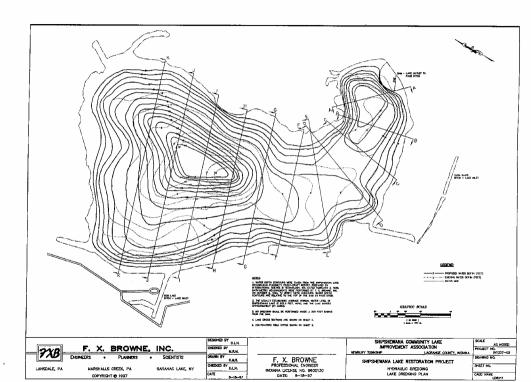
Agency	Type of Approval	Date Applied	Date Approved
Lake Dredging	·		
IDNR Division of Water	Lakes Preservation Act Permit (State Form 43008)	July 1, 1997	Pending
IDEM	Water Quality Certification	IDEM considers the USACE public notice its application	
LaGrange County Soil and Water Conservation District	Soil Erosion and Sediment Control Plan Approval	To be applied for	
IDEM	NPDES General Permit for Stormwater from Construction Activities	To be applied for	
IDNR Dams and Levees Section	Dam Permit (will be needed if sediment basins are constructed)	To be applied for if needed	
Constructed Wetlands			
IDNR Division of Water	Flood Control Act Permit (State Form 42946)	To be applied for	
LaGrange County Drainage Board	Approval	To be applied for	

ATTACHMENT # 1 LAKE DREDGING PLANS

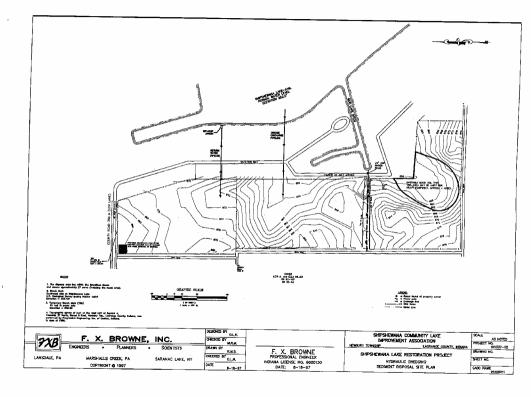




COPYRIGHT • 1997

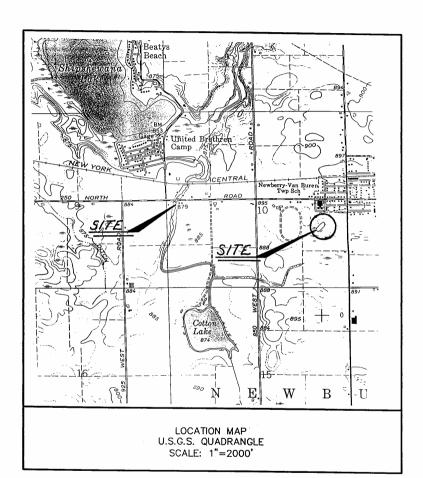


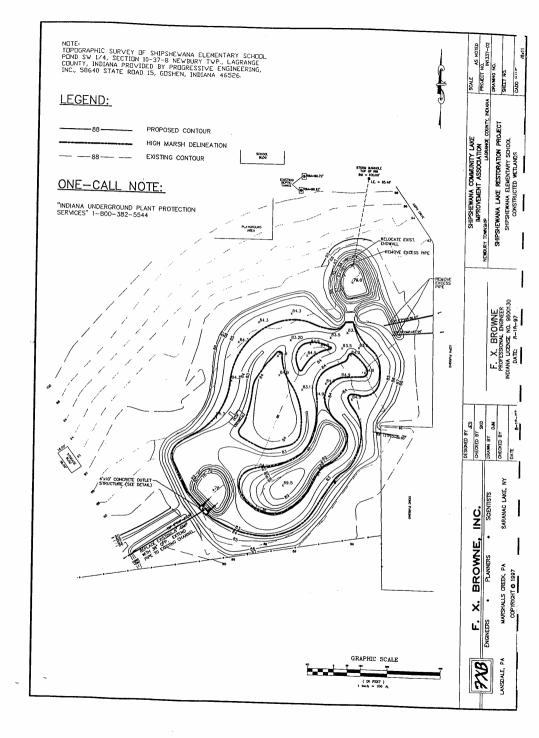
LAKE DREDGING PLAN

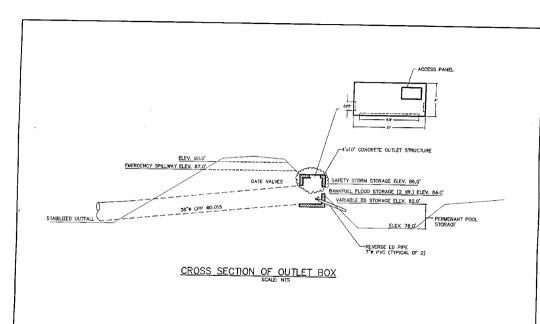


ATTACHMENT # 2

SHIPSHEWANA ELEMENTARY SCHOOL CONSTRUCTED WETLAND PLANS



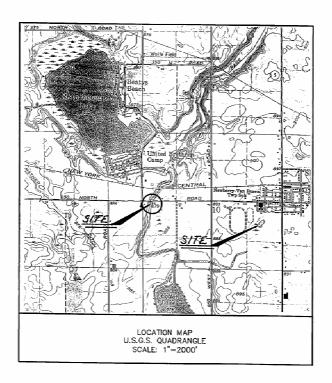


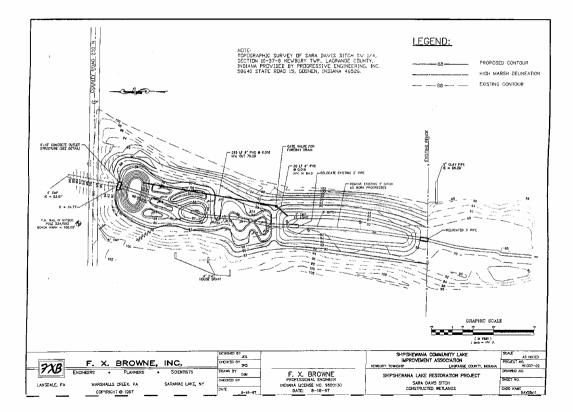


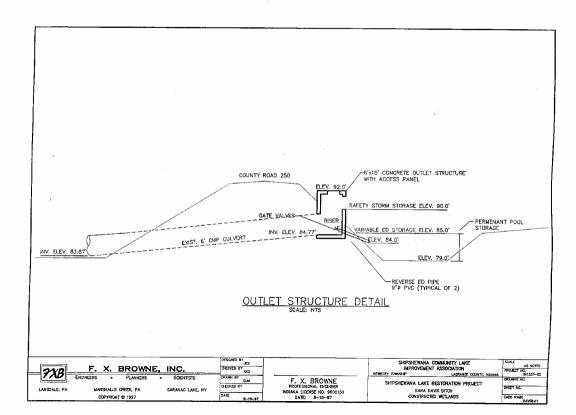
F. X. BROWNE, INC. ENGINEERS PLANNING SOCKINGTS LANSCALE PA MARKENIS OFFER, PA COPPRISENT O 1697 COPPRISENT O 1697	DESIGNED BY ACS CHECKED BY SKD DRAWN BY DAM CHECKED BY DATE 8-18-97	F. X. BROWNE PROFESSIONAL ENGINEER ROMAN LICENSE NO. 6600130 DATE 8-18-9	SHIPSHEWANA LAKE RESTORATION PROJECT SHIPSHEWANA ELEMENTARY SCHOOL	DRAMING NO. SHEET NO. CADO HAVE
				ELEMB _X 1T

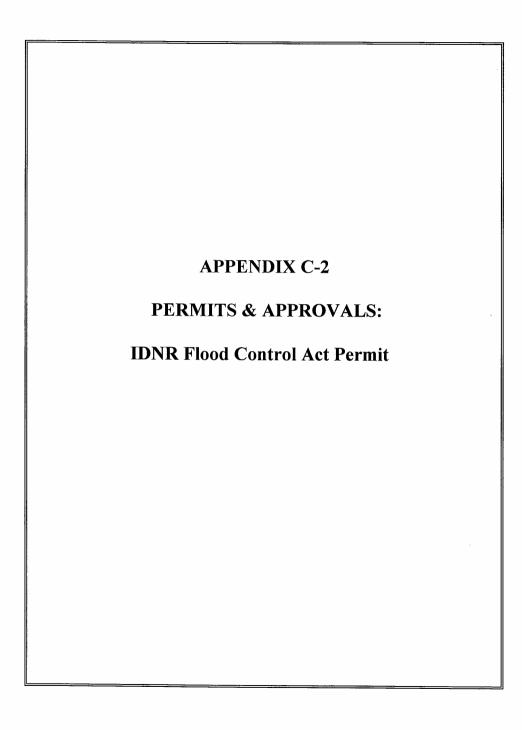
ATTACHMENT # 3

SARA DAVIS DITCH CONSTRUCTED WETLAND PLANS









ADMINISTRATIVELY COMPLETE NOTICE

F:rmit Administration Section

.vision of Water

Room W264

402 West Washington Street dianapolis IN 46204

Application #: FW-18,557

Siream: UNT Shipshewana Lake

Anplicant:

Shipshewana Community Lake Improvement Association Michael Martin, President 3485 North 980 West Shipshewana IN 46565 Notice Date: September 30, 1997

Telephone #: (317) 233-5635

FAX # : (317) 233-4579

Local Name: Sara Davis Ditch

Type: Construction in a floodway

Agent:

F.X. Browne, Inc P.O. Box 401 Lansdale PA 19446

Pear Applicant:

On August 25, 1997, the Division of Water received your permit application under the Flood Control Act, IC 14-28-1, with the associated Flood Hazard Area Rule, 310 IAC 6-1, for the project described on the next page. Based on staff's preliminary review, your application has been deemed administratively complete. Further review of your application will be performed by Department staff to determine if additional technical or environmental information is required. If so, you will be notified by mail at a later date. A receipt for your application fee is enclosed.

If you have any questions regarding the status of your application, please contact the appropriate staff member at the address shown above or at one of the following telephone numbers. Refer to application # FW-18,557 in all correspondence with the Department.

Responsibility	Staff	Telephone and FAX #
Administrative	Markita L. Shepherdson	(317) 233-5635, 233-4579
Technical	H. Mike Yamin, PE	(317) 232-5660, 233-4579

In addition to a permit from the Department of Natural Resources, you may also be required to obtain a permit from, or coordinate with, the following agencies. Contact with these agencies is your responsibility.

phone #
) 226-2218) 233-2471) 287-1829) 463-7818

Be advised that this notice is not a permit nor an authorization to proceed with the project. It should not be construed as a waiver of the provisions or requirements of any other state, federal, or local regulatory activity.

NOTICE COMPLETE ADMINISTRATIVELY

ermit Administration Section

.vision of Water

om W264

)2 West Washington Street ndianapolis IÑ

pplication #: FW-18,557

tream: UNT Shipshewana Lake

Notice Date: September 30, 1997

Telephone #: (317) 233-5635

: (317) 233-4579 FAX #

Type: Construction in a floodway

Local Name: Sara Davis Ditch

The proposed 1.7 acre wetland treatment system will be constructed at the escription: southern inlet stream to Shipshewana Lake. Excavated areas include a 280' \times 100' sediment trap in the upper portion of the project and a 310' \times 100' sediment trap and wetland area in the lower portion of the project. A 60' long x 3' high rock filter will separate the two areas. The outlet will consist of a 6' x 15' concrete riser attached to an existing 6' culvert. Other construction activities include the placement of 295 linear feet of 6" PVC pipe and the relocation of a 3' x 12' CMP pipe. Details of the project are contained in plans and information received at the Division of Water on August 25, 1997.

Location:

Just south (upstream) of CR 250 North crossing over an unnamed tributary of Shipshewana Lake near Shipshewana, LaGrange County

pc: F.X. Browne, Inc



F. X. Browne, Inc.

Engineers • Planners • Scientists

August 21, 1997

Mr. Scott McClarney Indiana Department of Natural Resources Division of Water 402 West Washington Street, Room W264 Indianapolis, IN 46204

RE:

Shipshewana Lake Restoration Project Sara Davis Ditch Constructed Wetland

FXB File No. IN1337-02

Dear Mr. McClarney:

The enclosed "Permit Application For Construction In a Floodway" (State Form 42946) is being submitted per the Flood Control Act (IC 14-28-1). The permit application pertains to the proposed construction of a wetland area in the Shipshewana Lake watershed in LaGrange County, Indiana. The wetland area will be constructed in the Sara Davis Ditch and will cover approximately 1.7 acres. It will improve the water quality of Shipshewana Lake by removing pollutants from stormwater runoff before the water reaches the lake .

If you have any questions or concerns during the review period, please do not hesitate to call me.

Sincerely,

F. X. BROWNE, INC.

Donna Z. Hegge

By:

Donna L. Hegge

/dlh

Enclosure

cc: Mike Martin, Shipshewana Community Lake Improvement Association Michael Massonne, IDNR Division of Soil Conservation Engineer

John Konik, USACE



Mail To:

Division of Water Department of Natural Resources 402 West Washington Street, Room W264 Indianapolis, Indiana 46204 Telephone: (317) 232-5660

REQUIREMENT FOR ADDITIONAL INFORMATION AND PERMITS

Application made to and approval granted by the Department of Natural Resources does not in any way relieve the applicant of the necessity of securing easements or other property rights, permits and approvals from affected property owners and other local, state, and federal agencies.

1. APPLICANT	INFORMATION	2. AGENT OR ENG	SINEER INFORMATION
Name of Applicant Shipshewar		Name of Agent or Engineer	
Improvement Assoc., Michael Martin, President		F. X. Browne, Inc.	
Address (Street, P.O. Box or Rural R 3485 North 980 West	oute)	Address (Street, P.O. Box or Rural P.O. Box 401	Route)
City, state and ZIP code Shipshewana, IN 4656	5	City; state and ZIP code Lansdale, PA 1944	6
Home Telephone Number (219)768-4541	Work Telephone Number (219)593-2000 ×347	Work Telephone Number (215) 362-3878	for all correspondence
3.	LOCATION OF THE	DDODOCED DDO IFOT	
Body of Water	LOCATION OF THE	PROPOSED PROJECT U.S.G.S. Quadrangle Map	
Sara Davis Ditch		Shipshewana, IN	
County		Quarter Section (Check one)	Section or Grant
LaGrange		□ NE □ NW □ SE X□ SW	10
Civil Township Newbury		Township (Check direction) 37 ★ N or □ S	Range (Check direction)
Nearest City or Town		N or 🗆 S .	8_X□ E or □ W
South of Van Buren			
Additional location information (dis	tance from major roadways, bridges, landr	narks, etc.)	
See attached, Block			
, , , , , , , , , , , , , , , , , , , ,	<u> </u>		
4.	NATURE OF THE	PROPOSED PROJECT	
C. A			
Access ChannelBridge or Culvert	☐ Dam or Impoundment	☐ Flood Control	□ Outfall Structure
Building	☐ Excavation ☐ Fill	☐ Levee	☐ Residence Addition
a building	C) Fill	☐ Mining	 □ Seawall or Bank Protection □ Utility
			a stillty
Other, please specify:			
See attached, Blo	25k # 4		
5.	DIIRDOSE OF THE	PROPOSED PROJECT	
State the purpose, necessity, and o	description of the proposed activity.	THO TOSED PROJECT	
See attached B	lo -l. # 5		
See attached, R	10CK # 5		
	-	·	

6. NAMES AND ADDRESSES OF THE PROPER	TY OWNER AND ADJOINING LANDOWNERS
Provide the name and address of the property owner where the owners which may be affected by the proposed project. Use address and each adjoining landowner may cause a permit issued by	ditional sheets if necessary. Failure to list the property owner(s)
Property Owner(s) LaGrange County Drainage Board	Adjoining Landowner *1 Pletchek, Dwayne & Areta L.
Address (Street, P.O. Box or Rural Route) 114 West Michigan Street	Address (Street, P.O. Box or Rural Route) P.O. Box 6
City, state and ZIP code LaGrange, IN 46761	City, state and ZIP code Shipshewana, IN 46565
Adjoining Landowner #2 Berea Missionary Church, Board of Trustees	Adjoining Landowner *3 Mast, Melvin J.
Address (Street, P.O. Box or Rural Route)	Address (Street, P.O. Box or Rural Route) . 1695 N 850 W
City, state and ZIP code Shipshewana, IN 46565	City, state and ZIP code Shipshewana, IN 46565
Adjoining Landowner #4 Prough, Malcolm D., Living Trust	Adjoining Landowner *5 Stultzfus, Merl D.
Address (Street, P.O. Box or Rural Route) 2520 N 250 W	Address (Street, P.O. Box or Rural Route) 8895 W 250 N
City, state and ZIP code Shipshewana, IN 46565	City, state and ZIP code Shipshewana, IN 46565
Adjoining Landowner #6	Adjoining Landowner #7
Address (Street, P.O. Box or Rural Route)	Address (Street, P.O. Box or Rural Route)
City, state and ZIP code	City, state and ZIP code
Adjoining Landowner #8	Adjoining Landowner #9
Address (Street, P.O. Box or Rural Route)	Address (Street, P.O. Box or Rural Route)
City, state and ZIP code	City, state and ZIP code
Adjoining Landowner #10	Adjoining trandowner #11
Address (Street, P.O. Box or Rural Route)	Address (Street, P.O. Box or Rural Route)
City, state and ZIP code	City, state and ZIP code
7. ADDITIONAL	INFORMATION 13
Corps Public Notice #, IDNR Early Coordinatio	n #
See attached, Block # 7	
1	
	· ·
8. STATEMENT O	FAFFIRMATION
I hereby swear or affirm, under the penalties for perjury, that th and belief, true, accurate and complete, and that the property ow	e information submitted herewith is to the best of my knowledge rner(s), and adjoining landowners have been notified of the project.
Signature of Applicant of Authorized Representative	Date
1 All rue	8-20-97

Permit Application for Construction In a Floodway State Form 42946 (R2/4-91)

Shipshewana Lake Restoration Project Sara Davis Ditch Constructed Wetland FXB File No. IN1337 - 02

General Information

۸.

Nonrefundable Processing Fee - See attached check for \$50.

Proof of Public Notice as Required by IC 14-11-4 - In order to meet the requirements of Indiana Code 14-11-4, all property owners and adjacent property owners were identified. Form N2 was prepared and sent by certified mail to each property owner listed in Block #6. See the attached copy of Form N2 and copies of the return receipts (PS Form 3811, Green Cards) received. Form N-4 was completed (see attached).

Form N2

PUBLIC NOTICE

LaGrange County Drainage Board 114 West Michigan Street LaGrange, IN 46761

Date: August 6, 1997

Indiana Code 14-11-4 was enacted to ensure that adjacent property owners are notified of permit applications and provided with an opportunity to present their views to the Department of Natural Resources prior to action.

Under this legislation, the applicant or agent is responsible for provident notice to the owner of the real property owned by a person, other than the applicant, which is both of the following: 1) located within one-fourth (1/4) mile of the site where the licensed activity would take place, and 2) has a border or point in common with the exterior boundary of the property where the licensed activity would take place, included is property, which would share a common border if not for the separation caused by a roadway, stream, channel, right-of-way, easement, or railroad.

Due to your proximity to the project site, you are considered to be an adjacent property owner; therefore, notice is being provided in conformance with the provisions of IC 14-11-4 and 310 IAC 0.6.

Applicants Name, Address, and Telephone

Agents Name, Address, and Telephone

F. X. Browne, Inc.

P.O. Box 401

Attention: Donna Hegge

Shipshewana Community Lake Improvement Association Michael Martin, President 3485 North 980 West Shipshewana, IN 46565 H-(219) 768-4541(after 4:30 pm)

orth 980 west Lansdale, PA 19446 ewana, IN 46565 (215) 362-3878 (215) 362-3878

Lake Name: Shipshewana Lake Ditch Name: Sara Davis Ditch

Project Description and Location: Shipshewana Lake contains an excessive amount of sediment. Excessive sedimentation results in accelerated lake aging (eutrophication). Eutrophication is caused by nutrient and sediment loading to the lake from increased stormwater runoff from lawns, construction sites, farm fields and streets. This situation causes excessive algae and aquatic weed growth in the lake, which negatively effects lake ecology and recreational potential. To treat urban and agricultural stormwater runoff before it enters Shipshewana Lake, a wetland will be constructed in a 750 foot section of the Sara Davis Ditch. The area is located just south of 250 North Road at the intersection of 900 West Road.

Relevant Statute or Rule:

- Flood Control Act, IC 14-28-1
 Lake Preservation Act, ICX 14-26-2
 Ditch Act", IC 14-26-5
- ☐ Channels Act, IC 14-29-4
 ☐ Removal of Sand or Gravel, IC 14-29-3

Questions Relating to the Project Should Be Directed To: F. X. Browne, Inc. (215) 362-3878

		- PENDED				ı
		SENDER: 2 = Complete ferits 1 and/or 2 for additional services. 5 = Complete flerits 2, 4 are and 4b. 5 = Complete flerits 2, 4 are and 4b. 6 = Complete flerits 2, 4 are and 4b. 7 = Complete flerits 2, 4 are and 4b. 7 = Complete flerits 2, 4 are and 4b. 7 = Complete flerits 2, 4 are and 4b. 7 = Complete flerits 2, 4 are and 4b. 7 = Complete flerits 2, 4 are and 4b. 7 = Complete flerits 2, 4 are and 4b. 7 = Complete flerits 2, 4 are and 4b. 7 = Complete flerits 2, 4 are and 4b. 7 = Complete flerits 2, 4 are and 4b. 7 = Co	e can return this	I also wish to receive the following services (for an extra fee):	_	:
		Attachethic form to the front of the		1. Addressee's Address	ė,	
	1.6	Write Return Receipt Requested on the mailpiece below the article	le number.		n Receipt Service	Ì
	14	the Betyrn Recept will show to whom the article was delivered an	d the date	2. Restricted Delivery	Š	i
	1.6	3. Mide Addressed to:	4a. Article N	Consult postmaster for fee.	ᇹ	
	: 2	Fa 07(0)	7 2	W 7/ 7/ 177	æ	ì
		Every mussionary	4b. Service	Type .	Return	1
		is a diffusion	☐ Register	., .	<u>8</u>	1
	ij	88535 N 900 U)	☐ Express		gi	ļ
4) 5	Shickhel son Tal		ecelpt for Merchandise COD	for using	
	14	enda mara To	7. Date of D	a	- 6	1
	NO		رر کا R Addroson	8-11-37	_ 호	1
	1111	3. Hecewed By: (Print Name)	and fee is	e's Address (Only if requested	Thank you	Í
	Ä	6. Signature (Addressee or Agent)	ľ		두	1
	1	×X 155 LZILOZI	iiiii ii	i ii (iii ii		į
1.6	1/2	PS Form 38,11, December 1994	111111111	Domestic Return Receipt	7	1
	ſ,	nos.		Someone Herain Hereip	ı	1
	<u>6</u>	SENDER:				1
	side?	Complete items 1 and/or 2 for additional services. Complete items 3, 4a, and 4b.		I also wish to receive the following services (for an		
	reverse	Print your name and address on the reverse of this form so that we card to you.		extra fee):		
	řě	Attach this form to the front of the mailpiece, or on the back if space permit.	does not	 Addressee's Address 	Š	1
	the the	permit. Write "Return Receipt Requested" on the mailpiece below the article The Return Receipt will show to whom the article was delivered and	number.	2. Restricted Delivery	Ser	
Manage in a serious sections		doilyolog.	ino date	Consult postmaster for fee.	ğ	المانية
	ted	3. Article Addressed to:	4a. Article Nu	mber	Receipt Service	free.
	completed	Duayne & areta Pletchel	$n \ge$	<u>310261126</u>	E	i
	5	V 10 (2) (4b. Service T		Return	1
•			☐ Registere		g	ì
	띭		☐ Express M	Mail ✓ ☐ Insured Delipt for Merchandise ☐ COD	using	1
4.50	ă		7. Date of De		for	ĺ.
	ž	4(05(05)	8-115	79	90	
	RETURN AUDRESS	5. Received By: (Print Name)	8. Addressee and fee is	r's Address (Only if requested	Thank you	:
		6. Signature: (Addressee or Agent)	474 700 10	pulay	Ĕ	
	ls your	X Art Otilities				
	8	PS Form 3811, December 1994		Domestic Return Receipt		
				Domestic Neturn Neceipt		i
	6.	SENDER:				1
	side?	■ Complete items 1 and/or 2 for additional services. ■ Complete items 3, 4a, and 4b.	l	I also wish to receive the following services (for an		!
	rse	Print your name and address on the reverse of this form so that we card to you.		extra fee):		
	reverse	Attach this form to the front of the mailpiece, or on the back if space permit.		 Addressee's Address 	Receipt Service	Ì
	the	■Write*Return Receipt Requested* on the mailpiece below the article ■The Return Receipt will show to whom the article was delivered and	number.	2. Restricted Delivery	Ser	i
Bas 1 1 1	- 5	delivered.	ino date	Consult postmaster for fee.	ip	j
	eted	3. Article Addressed to:	4a. Article Nu		Ş	ļ.:
	ble	Faliranas Countir		510261125	E .	i
	compl		4b. Service T		Retu	l
	SS		☐ Registere ☐ Express N	. /		ĺ
	2		☐ Express N ☐ Return Rec	Aail Insured elpt for Merchandise ☐ COD	usir	İ
	ADE		7. Date of De		Thank you for using	1
	N.	- THE WIGH IN 46 161		8-11-97	70.	ì
	D	5. Received By: (Print Name)	8. Addressee	's Address (Only if requested	Ŗ,	:
	IS your RETURN ADDRE	6. Signature: (Addressee or Agent)	and fee is	раю)	Tha	1
	you		1 -			į
	8	PS Form 3811 December 1994	<u> </u>	Domesti- D		į
	1	PS Form 3811 , December 1994		Domestic Return Receipt		į

	SENDER: Complete items 1 and/or 2 for additional services. Complete items 3, 4a, and 4b. Print your name and address on the reverse of this form so that we card to you. Attach this form to the front of the maliplece, or on the back it space permit. Write 'Return Receipt Requested' on the maliplece below the article may be a statement. 3. Article Addressed to:	Addressee's Addressee and the date 1. Addressee's Addressee'	for using Return Receipt Service.
· · · · · · · · · · · · · · · · · · ·	5. Received By: (Print Name) 6. Signature: (Addressee or Agent) XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	8. Addresseo's Address (Only if requested and fee is paid)	Thank you
Series of the Series	PS Form 3811 , December 1994	Domestic Return Receipt	
	Complete items 1 and/or 2 for additional services. Complete items 3, 4a, and 4b. Print your name and address on the reverse of this form so that we card to you. Attach this form to the front of the malipiece, or on the back if space pomit. White 'Return Receipt Requested' on the malipiece below the article as "The Return Receipt will strow to whom the article was delivered and to the property of the second services and the second second services and the second se	does not 1. □ Addressee's Address 2. □ Restricted Delivery	The second secon
Managara na managarana da	3. Article Addressed to:	4b. Service Type	
S PARTE NOT LA COLLEGE		Express Mail Insured Insured Return Receipt for Merchandise COD 7. Date of Delivery 7. (11-97) 8. Addressee's Address (Only if requested and fee is paid)	
! <u>-</u>	PS Form 3811 , December 1994	Domestic Return Receipt	+
995	"Write "Return Receipt Requested" on the mailpiece below the article The Return Receipt will show to whom the article was delivered and delivered.	does not 1. Addressee's Address	
	3. Article Addressed to: Meyin Mast 1695 N 850 W Shipshewana IN 46565	Consult postmaster for fee. 4a. Article Number 4b. Service Type Registered Express Mail Retum Receipt for Merchandise COD 7. Date of Delivery 8. Addressee's Address (Only if requested and fee is paid)	
	PS Form 3811, December 1994	Domestic Return Receipt	

Domestic Return Receipt

AFFIRMATION OF PERSONAL SERVICE, 1ST CLASS MAIL SERVICE, OR CERTIFIED MAIL SERVICE

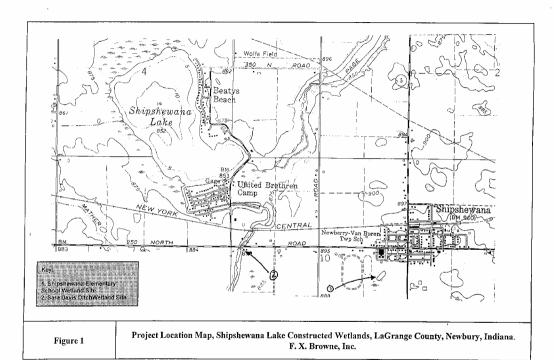
I have provided public notice to the listed property owners in conformance with the provisions of IC 14-11-4 and 310 IAC 0.6 through the method indicated below. Check the appropriate box.

The state of the s	and was the second of the property of the prop
Property Owner (if not applicant) See Block #6 of State Form 42946	Personal service was provided on:(date)
Address	1st Class Mail service was provided on: (date) I affirm that 21 days have passed without the mailing returned as undelivered or undeliverable. Attached is PS Form 3817 as proof of mailing.
City, State, Zip Code	Certified Mail service was provided on: 8/6/97 (date) Attached is PS Form 3811 (green cards) as proof of mailing.
Property Owner	☐ Personal service was provided on:(date)
Address	□ 1st Class Mail service was provided on:(date) I affirm that 21 days have passed without the mailing returned as undelivered or undeliverable. Attached is PS Form 3817 as proof of mailing.
City, State, Zip Code	☐ Certified Mail service was provided on:(date) Attached is PS Form 3811 (green cards) as proof of mailing.
Property Owner .	☐ Personal service was provided on:(date)
Address	□ 1st Class Mail service was provided on:(date) I affirm that 21 days have passed without the mailing being returned as undelivered or undeliverable. Attached is PS Form 3817 as proof of mailing.
City, State, Zip Code	Certified Mail service was provided on:(date) Attached is PS Form 3811 (green cards) as proof of mailing.
Property Owner	Personal service was provided on:(date)
Address	☐ 1st Class Mail service was provided on:(date) I affirm that 21 days have passed without the mailing being returned as undelivered or undeliverable. Attached is PS Form 3817 as proof of mailing.
City, State, Zip Code	Certified Mail service was provided on:(date) Attached is PS Form 3811 (green cards) as proof of mailing.

(Signature) 8-20-9

Block #3 - Location of the Proposed Project

The Sara Davis Ditch flows from Cotton Lake to Shipshewana Lake, and is located in Newbury, Indiana. From the town of Shipshewana, take 250 North Road west to 900 West Road. Turn right onto 900 West Road and park at the Berea Missionary Church at that intersection. Cross 250 North Road and the 600 foot section of Sara Davis Ditch is just south and adjacent to 250 North Road. See also Figure 1.



Block #4 - Nature of Proposed Project

The Shipshewana Lake Restoration Project consists of several water quality improvement measures. Already underway is the stabilization of approximately 4,500 linear feet of the lake's western and northeastern shoreline using coir fiber bundles and wetland vegetation. Scheduled for later this year are the dredging of the lake and the enhancement of an existing wetland at the Shipshewana Elementary School which is currently used for stormwater treatment. This permit application pertains to the construction of a wetland area in the Sara Davis Ditch (see Attachment #1 - Sara Davis Ditch Constructed Wetland Plans).

The Sara Davis Ditch is a county regulated drainageway which flows from Cotton Lake to Shipshewana Lake. It is one of two inlets to Shipshewana Lake. A 600 foot section of this "ditch" adjacent to and south of Route 250 currently serves as a water conveyance channel and provides no pollutant removal. In fact, the current erosion of this ditch during stormflows is contributing nutrient and sediment pollution to Shipshewana Lake. A properly designed constructed wetland system in this area would be capable of removing high concentrations of nutrients, suspended particles, and other pollutants from approximately 2,100 acres of the Shipshewana Lake watershed. The drainage easement is 150 feet wide at this site; therefore, a 2.1 acre area is available for a constructed wetland system.

The wetland area required for treating the drainage from the 2,100 acre watershed to the Sara Davis Ditch site is 15 acres based on standard calculations for sizing wetlands. However, the topography and peaking factors for this agricultural portion of Indiana are significantly different than average conditions, and standard runoff equations do not adequately reflect the actual runoff in the area. According to Rex Pranger, LaGrange County Engineer, there is significant depression storage within the watershed by natural depressions, man-made farm ponds and Cotton Lake; therefore, the time of concentration to the Sara Davis Ditch location is extremely long and storm peaks are spread out over time. Mr. Pranger indicated that the water level in the Sara Davis Ditch at the proposed wetland site does not increase significantly during storm events. Occasionally during a very large storm event or during a high snow melt event, the water in the Sara Davis Ditch only slightly overflows its banks. Based on this information and on our field evaluation of this site, we feel that the 2.1 acre area that is available at this site would be adequate for a constructed wetland treatment system.

A 1.7 acre pond-wetland system specifically for the removal of agricultural associated pollutants will be constructed in the Sara Davis Ditch. An enlarged sediment forebay will be installed to enhance the removal of suspended particles. The remaining portion of the system will be vegetated according to the planting plan for the biological removal of nutrients and other pollutants. Instead of a single channel running uncontrolled through the area, the system will detain and control stormflows, evenly discharging water to a densely vegetated, meandering system. Treatment is essential at this location since there is significant agricultural activity in this portion of the watershed.

Fertilizing and soil disturbance associated with farming methods used by local farming operations introduces high concentrations of sediments and nutrients to the Sara Davis Ditch.

Block #5 - Purpose of the Proposed Project

Shipshewana Lake is approximately 205 acres in size and was created in the early 1960's through the installation of a sheet pile dam. This dam discharges into Page Ditch, the only outlet of the lake. Shipshewana Lake has two inlets: Sara Davis Ditch on the south side, and Mud Lake Ditch on the west side.

The Shipshewana Lake Watershed encompasses approximately 4,675 acres, with predominantly agricultural land uses. However, low density residential use is increasing. The land adjacent to the lake is heavily developed with single family residences and a church camp. The eastern shore was developed in the mid 1960's. At that time, the marsh that existed at the mouth of Mud Lake Ditch was filled in with material dredged from the lake. The northeastern shoreline was developed in the late 1960's, and was originally used for pasture land. Three channels have been excavated at the north end of the lake for access to new development.

Since the late 1970's, the water quality and general condition of Shipshewana Lake has declined dramatically. In 1986, the lake was classified as a Class Three Lake, which is considered an advanced eutrophic lake of the lowest quality (Indiana Department of Environmental Management, Indiana Lake Classification System and Management Plan). It was classified this way due to a total phosphorus concentration of 0.045 mg/l and a Secchi disc transparency of 3 feet. A Eutrophication Index value of 51 was calculated for the lake (scale 0 to 75). In addition, extreme blue-green algae blooms are common during the growing season resulting in Secchi disc transparency readings of 0.5 feet.

A thick, unconsolidated layer of organic sediment exists on the lake bottom all year round. During peak growing season anoxic conditions persist in this layer as well as in the water column above it. As a result, lake use has suffered, swimming has been banned, boating is hampered due to algae scums and fishing has declined. The receiving streams (Page Ditch, Pigeon River) are impacted as well.

The purposes of the shoreline stabilization and the lake dredging aspects of the project have been summarized in separate permit applications. The purpose of the Sara Davis Ditch Constructed Wetlands is to clarify, filter and biologically treat the sediment, nutrients and other pollutants present in stormwater runoff in the Shipshewana Lake watershed before this water reaches the lake. Constructing wetlands will help improve the water quality and restore the recreational value of Shipshewana Lake.

Box #7 - Additional Information

A US Army Corps of Engineers Permit has not yet been submitted for the Sara Davis Ditch Constructed Wetlands project, and an IDNR Early Coordination Number has not been obtained. An application is currently being developed for a US Army Corps of Engineers Individual Permit for the lake dredging, the Shipshewana Elementary School Constructed Wetland and the Sara Davis Ditch Constructed Wetland. The LaGrange County Drainage Board will comment on and approve the constructed wetlands plans. See the attached letter from James Hebenstreit, Assistant Director of the IDNR Division of Water, which addresses the state permitting needs of the Shipshewana Lake Restoration Project.

The shoreline stabilization aspect of the project has received a Permit for Construction In or On a Public Freshwater Lake, a US Army Corp of Engineers Nationwide Permit #13, Soil Erosion and Sediment Control Plan approval and coverage under the NPDES General Permit for Storm Water Runoff Associated with Construction Activity.

Site visits of the lake and the sediment disposal area were performed by IDNR Division of Water personnel in June of 1996 and by Army Corps of Engineers personnel in October of 1996.



INDIANA DEPARTMENT OF NATURAL RESOURCES

PATRICK R. RALSTON, DIRECTOR

Division of Water 402 W. Washington St., Rm. W264 Indianapolis, Indiana 46204-2748 317-232-4160 FAX: 317-233-4579 Suzanne Forbes

FAX: 317-233-4579 Suzanne Forbes FX Browne, Inc. P.O. Box 401 Lansdale, PA 19446 October 24, 1996 REC #44-960926-1

Re: Lagrange - Shipshewana G - Shipshewana Lake Cotton Lake Ditch Mud Lake Ditch

Dear Ms. Forbes:

Thank you for your letter of September 18, 1996 requesting information concerning water quality improvement projects on tracts of land near Shipshewana Lake, Sara Davis Ditch (Cotton Lake Ditch) and Mud Lake Ditch. Based on your description, the project consists of six components; shoreline stabilization along the western shore of Shipshewana Lake, shoreline stabilization along the northeastern shore, enlargement of wetland near Shipshewana Elementary School, creation of a wetland in Sara Davis Ditch (Cotton Lake Ditch), a sediment disposal basin approximately 700 feet west of Shipshewana Lake, and installation of a culvert on Mud Lake Ditch through the proposed sediment disposal basin. The majority of this project is in Section 4, Township 37 North, Range 8 East except for the two proposed wetlands which lie in Section 10, Township 37 North, Range 8 East in Lagrange County.

For your information, the 100-year frequency flood would reach an elevation of about 853.7 feet, NGVD, for this lake. This elevation is about 1.7 feet above the lake's legally established average normal water level of 852.0 feet, NGVD.

Any proposed change to the bed or shoreline of Shipshewana Lake will require the prior approval of the Department of Natural Resources under the provisions of the Lakes Preservation Act, IC 14-26-2. Therefore, the shoreline stabilization and dredging components of your project will require a permit from the Department of Natural Resources.

IC 14-28-1 prohibits constructing abodes or residences in or on a floodway and requires the prior approval of the Department of Natural Resources for any other type of construction, excavation, or filling in or on a floodway. To be approvable a project should be designed so that it will not restrict the floodway, be unsafe to life and property, nor adversely affect the fish, wildlife, or botanical resources. The proposed wetland located on Cotton Lake Ditch at County Road 250 North will require a construction in the floodway permit from the Department of Natural Resources.

The enlargement of the wetland near Shipshewana Elementary School does not fall under IC 14-26-2 (Lake Preservation Act), IC 14-26-5 ("Ditch" Act), or IC 14-28-1 (Flood Control Act). Therefore, no permit is required from this Division for this portion of the project.

Letter to Ms. Forbes October 24, 1996 REC #44-960926-1 Page Two

Topographic mapping indicates that the drainage area of Mud Lake Ditch is less than 1 square mile. Approval of the Department of Natural Resources under IC 14-28-1 is not required for construction, excavation or filling at this site unless a dam is to be constructed. However, IC 14-26-5 requires that a permit must be obtained from this Department for the dredging of any ditch having a bottom depth lower than the normal water level of a freshwater lake of 10 acres or more and located within one-half mile of the lake. Therefore, if the sediment disposal basin is to be excavated to an elevation below 852.0 feet, NGVD, which is the legally established water level of Shipshewana Lake, a permit will also be required for this portion of the project. A copy of the appropriate application form is enclosed for your use.

You may also have to obtain a permit from the Corps of Engineers under Section 404 of the Federal Water Pollution Control Act or Section 10 of the Rivers and Harbors Act. Information relative to the Corps' of Engineers permits may be obtained from:

U.S. Army Corps of Engineers Detroit District Office P.O. Box 1027 Detroit, Michigan 48231 Telephone (313) 226-2218

You should not construe this letter to be a building permit, approval of the proposed project, or a waiver of the provisions of local building or zoning ordinances.

Thank you for this opportunity to be of assistance; your interest in providing safe floodplain development is appreciated. If you have any questions regarding this letter, please contact Ms. Dena C. Barnhouse, Hydraulic Engineer, in our Hydrology & Hydraulics Section, at (317) 232-4164.

Sincerely,

James J. Hebenstreit, P.E.

Assistant Director Division of Water

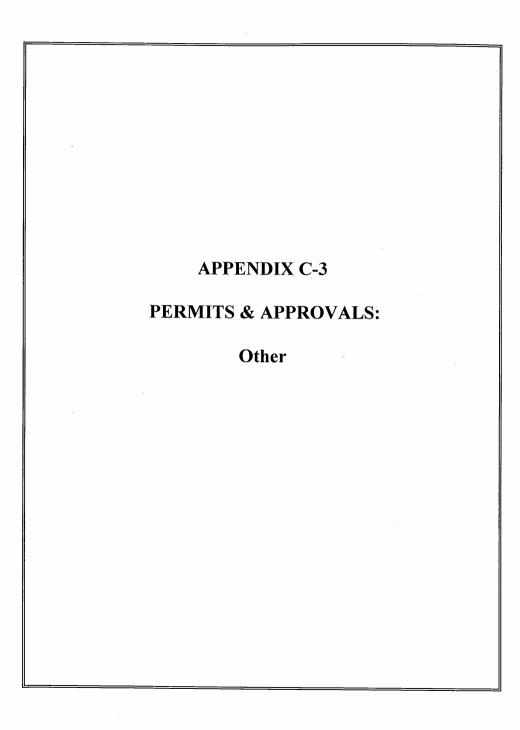
JJH/DCB

pc: Lagrange County Plan Commission Detroit District, Corps of Engineers

Enclosures: floodway permit application and instructions

lakes permit application and instructions

ditch project application



LAGRANGE CO. DRAINAGE BOARD

114 W. MICHIGAN · LAGRANGE, 1N 46761

PHONE: 219-463-2183

TN1337.02 SKD MMM DLH

30 March 1998

F.X. Browne, Inc. P.O. Box 401 Lansdale, PA 19446 Attention: Sharon Dotts

RE: Shipshewana Lake Restoration Project Elementary School Constructed Wetlands FXB Project No. IN 1337-02

Dear Ms. Dotts.

The LaGrange County Drainage Board at their March 17, 1998 meeting reviewed the proposed Wetland Restoration Project at the Shipshewana School in LaGrange County, Indiana. The Drainage Board approved the project with the condition that "as built plans" be provided at the conclusion of this work. With the outlet details being somewhat vague at present, "as builts" will provide an accurate record for the future.

Sincerely,

Rex R. Pranger

LaGrange County Surveyor

RRP/dk cc: File

PUBLIC NOTICE

JAN - 3 1998 SKI

Indiana Department of Environmental Management Office of Water Management Section 401 Water Quality Certification Program Date of Publication: December 30, 1997 IDEM Project ID: 97-44-BAC-00095-A Corps of Engineers ID: 97-144-034-OA

To all interested parties:

This letter shall serve as a formal notice of the receipt of an application for Section 401 Water Quality Certification by the Indiana Department of Environmental Management (IDEM). The purpose of the notice is to inform the public of active applications submitted for water quality certification under Section 401 of the Clean Water Act (33 U.S.C. § 1341) and to solicit comments and information regarding the proposed project. IDEM will evaluate whether the project complies with Indiana's water quality standards as set forth at 327 IAC 2.

1. Applicant: Shipshewana Community Lake Improvement 3485 North 980 West Shipshewana, IN 46565

- Location of proposed project: Shipshewana Lake, Sara Davis Ditch, Shipshewana Elementary School
- 3. Description of project:
 - A. Purpose/intended use To improve water quality and the recreational value of Shipshewana Lake and to create wildlife habitat and new environmental education opportunities.
 - B. Structures to be erected None.
 - C. Fill materials to be discharged or disposed:

Type/Composition - No fill is to be placed in the lake or wetlands. Quantity - None.

D. Impacts to wetlands or other aquatic resources: Hydraulic dredging of 350,000 cubic yards of sediment from 200 acres of Shipshewana Lake with contained disposal on adjacent upland. Excavation and redistribution of 1,440 cubic yards of material associated with the enhancement of 1.2 acres of existing wetland to expand to 2.0 acres. Excavation of 6,664 cubic yards and fill 339 cubic yards of material from 0.10 acres of Sara Davis Ditch and adjoining upland to create 1.7 acres of wetland and pond area.

Comment period:

Any and all persons or entities who wish to submit comments or information relevant to the aforementioned project may do so by January 20, 1998.

Request for a Public Hearing:

Any person may submit a written request that a public hearing be held to consider issues related to water quality in connection with the project detailed in this notice. The request for a hearing should be submitted within the comment perioc to be considered timely.

For further information:

Additional information may be obtained from Mr. Brett Crump, Project Manager, at 317/233-2475. A copy of the plan and elevation drawing showing the general and specific site location may be obtained from the project manager (where reproducible). Please address all correspondence to the project manager and reference the IDEM project identification number listed on this notice. Indicate if you wish to receive a copy of IDEM's final decision. Written comments and inquiries may be mailed to -

Indiana Department of Environmental Management Section 401 Water Quality Certification Program Post Office Box 6015 Indianapolis, Indiana 46206-6015



INDIANA DEPARTMENT OF NATURAL RESOURCES

PATRICK R. RALSTON, DIRECTOR

Division of Historic Preservation and Archaeology 402 W. Washington St., Rm. 274 Indianapolis, Indiana 46204 317-232-1646 January 30, 1997

Suzanne Forbes
F.X. Browne, Inc.
Post Office Box 401
Lansdale, Pennsylvania 19446

Dear Ms. Forbes:

We have reviewed the proposed stabilization of the western and northeastern shores of Shipshewana Lake, dredging of the lake and disposal of sediment, and the creation of wetlands northwest of Shipshewana in LaGrange County, Indiana.

As long as no structures will be demolished or removed, no known historical or architectural sites listed in or eligible for inclusion in the National Register of Historic Places will be affected by this project.

In light of the new information received by our office in the telephone conversation between Suzanne Forbes of F.X. Browne, Inc. and Sandra Walters of DHPA on January 3, 1997, all archaeological concerns have been addressed. Therefore, as long as the project remains within areas disturbed by previous construction no known archaeological sites listed in or eligible for inclusion in the National Register of Historic Places will be affected by this project.

However, if any archaeological artifacts or human remains are uncovered during construction, federal law and regulations (16 USC 470, et seq.; 36 CFR 800.11, et al.) and, additionally, state law (Indiana Code 14-21-1), require that work must stop and that the discovery must be reported to the Division of Historic Preservation and Archaeology within two (2) business days. Thank you for your cooperation.

If you have any further questions regarding the archaeological aspects of this project, please call Jim Mohow at (317) 232-1646. Thank you for your cooperation.

Very truly yours,

Patrick R. Ralston

State Historic Preservation Office

PRR:SLW:MMD:smg



INDIANA DEPARTMENT OF NATURAL RESOURCES.

PATRICK R. RALSTON, DIRECTOR

Division of Nature Preserves 402 W. Washington St., Rm. W267 Indianapolis, IN 46204 317-232-4052 Fax: 317-233-0133

September 26, 1996

Ms. Suzanne Forbes F. X. Browne, Inc. P.O. Box 401 Lansdale, PA 19446

Dear Ms. Forbes:

I am responding to your request for information on the endangered, threatened, or rare (ETR) species, high quality natural communities, and natural areas documented from the Shipshewana Lake area, Shipshewana, Indiana. The Indiana Natural Heritage Data Center has been checked and there are no ETR species nor significant areas documented from any of the Shipshewana Lake Water Quality Improvement Project sites.

The information I am providing does not preclude the requirement for further consultation with the U.S. Fish and Wildlife Service as required under Section 7 of the Endangered Species Act of 1973. You should contact the Service at their Bloomington, Indiana office.

U.S. Fish and Wildlife Service 620 South Walker St. Bloomington, Indiana 47403-2121 (812)334-4261

At some point, you may need to contact the Department of Natural Resources' Environmental Review Coordinator so that other divisions within the department have the opportunity to review your proposal. For more information, please contact:

Patrick R. Ralston, Director Department of Natural Resources attn: Stephen H. Jose Environmental Coordinator Division of Fish and Wildlife 402 W. Washington Street, Room W273 Indianapolis, IN 46204 (317)232-4080 Please note that the Indiana Natural Heritage Data Center relies on the observations of many individuals for our data. In most cases, the information is not the result of comprehensive field surveys conducted at particular sites. Therefore, our statement that there are no documented significant natural features at a site should not be interpreted to mean that the site does not support special plants or animals.

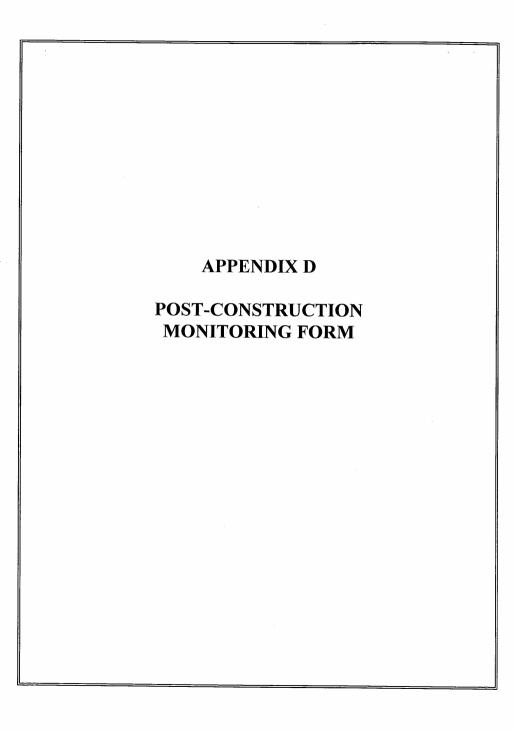
Due to the dynamic nature and sensitivity of the data, this information should not be used for any project other than that for which it was originally intended. It may be necessary for you to request updated material from us in order to base your planning decisions on the most current information.

Thank you for contacting the Indiana Natural Heritage Data Center. You may reach me at (317)232-4052 if you have any questions or need additional information.

Sincerely,

Konald P. Hellmich Ronald P. Hellmich

Indiana Natural Heritage Data Center

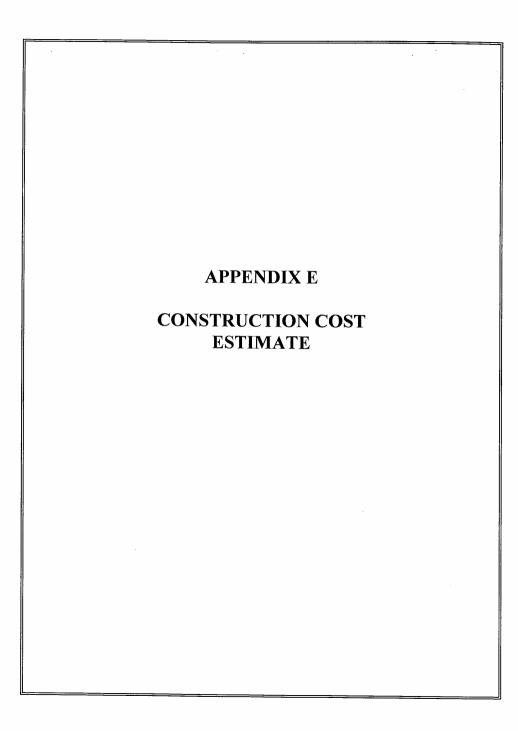


CONSTRUCTED WETLANDS MONITORING FORM

Volunteer's Name: _			
Wetlands Site:			
Date:			
Time:			
Air Temp:			
Weather: Si	unny Partly Cloudy	Overcast Ra	ain
Wind: 0-	-5 mph 5-10 mph	10-15 mph 15	5+ mph
Wind Direction:			
Structural Integrity:			
	Iuman Activity:		
			
Evidence of A	nimal Activity:		
Evidence of E	rosion:		
Damage to Ou	utlet Structure:		

Assessment of Vegetation: Wetland Plants: Type Number Herbaceous Cover: Type Number Shrubs: Type Number Trees Type Number

Depth of Silt:



Shipshewana Lake Restoration Constructed Wetlands, Elementary School Construction Cost Estimate FXB Project # IN1337-02

Task	description	quantity	unit	unit cost	Cost
Outlet Structure	concrete riser	1	ea	1,440	1,440
	36" dia CPP pipe	30	LF	52.03	1,561
Grading	cut & fill	1,440	cu.yd.	3.51	5,056
	cut & haul	3,399	cu.yd.	3.88	13,198
Landscaping	Duck Potato	5,808	ea	0.59	3,431
	Pickerelweed	5,808	ea	2.53	14,706
	Arrow Arum	1,936	ea	1.27	2,451
	Softstem Bulrush	7,744	ea	0.63	4,902
	Wild Rice	1,936	ea	0.63	1,225
	Common Three-Square	5,808	ea	0.59	3,431
	Reed Canary Grass	1,936	ea	0.63	1,225
	Blue Flag Iris	1,936	ea	1.06	2,042
	Rice Cutgrass	1,936	ea	0.63	1,225
	Soft Rush	2,178	ea	0.63	1,379
	Woolgrass	2,178	ea	0.63	1,379
	Wetland Seed Mix	10,890	sq.ft.	0.12	1,287
		Plants To	tal		38,685
Mobilization	15% of costs				0.004
Close Out	10% of costs				8,991
Siose Out	10 70 01 00505				5,994
TOTAL				74,924	

Shipshewana Lake Restoration Constructed Wetlands, Sara Davis Site Construction Cost Estimate FXB Project # IN1337-02

1.7 ac site

Task	description	quantity	unit	unit cost	Cost
Outlet Structure	concrete riser	1	ea	1,824	1,824
Grading	cut & fill, wetland cut & fill, to owner	339 6,325	cu.yd. cu.yd.		1,190 22,200
Landscaping	Duck Potato Pickerelweed Arrow Arum Softstem Bulrush Wild Rice Common Three-Square Reed Canary Grass Blue Flag Iris Rice Cutgrass Soft Rush Woolgrass Wetland Seed Mix	1,893 1,893 631 2,519 631 1,888 629 629 629 5,140 5,140 25,700 Plants To		0.59 2.53 1.27 0.63 0.63 0.59 0.63 1.06 0.63 0.63 0.63	1,118 4,793 799 1,595 399 1,115 398 664 398 3,254 3,254 3,037 20,824
Mobilization Close Out	15% of costs 10% of costs	<u>.</u>			6,906 4,604 57,547